RADIO & TELEVISION NEWS

JULY
1950
35¢
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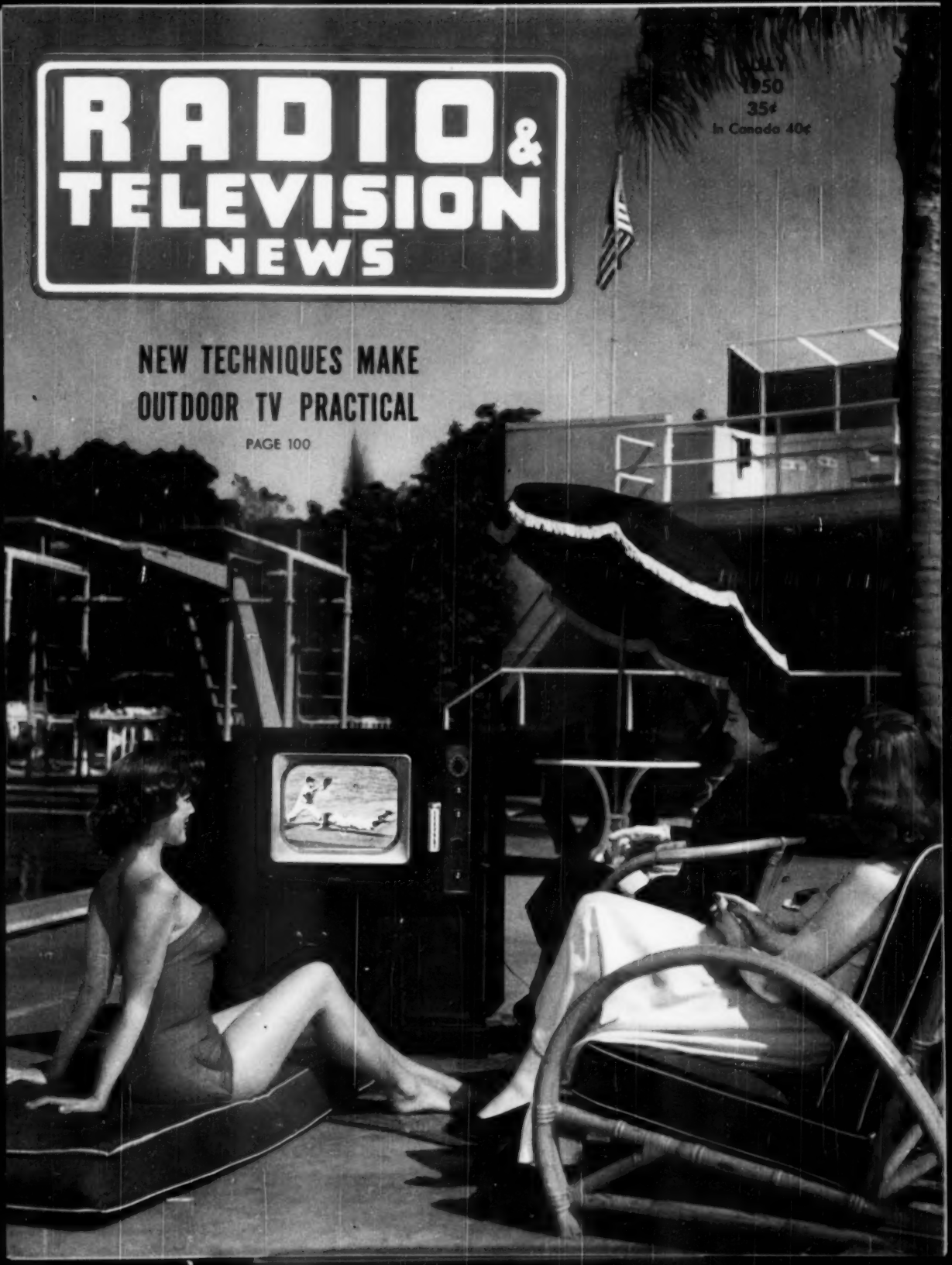
NEW TECHNIQUES MAKE OUTDOOR TV PRACTICAL

PAGE 100



Seven of the Top Ten are RCA

...pioneered for AM, FM, and TV

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Only tubes of unquestionable quality—both as to design and manufacture—could merit such acceptance by the industry. Here are leaders designed by the Leader—familiar types, such as the RCA 6SN7-GT and 6AG5 . . . and more recently the 1B3-GT, 6BA6, 6J6, 6AU6, and 6AL5. Their widespread application has permitted production to be concentrated on fewer types . . . which, in turn, has accounted for lower costs, improved quality, and greater uniformity.

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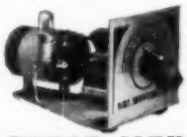
as part of my NEW Communications Course. Use it with Oscillator you also build that furnishes basic power to transmitter and determines transmitter frequency.



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COPYRIGHT 1950
ZIFF-DAVIS PUBLISHING COMPANY
185 North Wabash Ave., Chicago 1, Ill.
VOLUME 44 • NUMBER 1

Member
Audit Bureau of Circulations

RADIO & TELEVISION NEWS is published monthly by the Ziff-Davis Publishing Company, 185 N. Wabash Ave., Chicago 1, Ill. Subscription rates: in the United States $4.00 (12 issues), single copies 35c; in Canada $4.00 (12 issues), single copies 40c; in Mexico, South and Central America, and U. S. Possessions, $4.00 (12 issues); in British Empire, $5.00 (12 issues)—all other foreign countries $5.00 (12 issues). RADIO-ELECTRONIC ENGINEERING Edition: subscription rates: in the U. S. $6.00 (12 issues), single copies 50c; in Canada $6.00 (12 issues), single copies 60c; in Mexico, South and Central America, and U. S. Possessions, $6.00 (12 issues); in British Empire, $7.00 (12 issues)—all other foreign countries $7.00 (12 issues). Subscribers should allow at least 2 weeks for change of address. All communications about subscriptions should be addressed to: Director of Circulation, 185 N. Wabash Ave., Chicago 1, Ill. Entered as second class matter July 21, 1948, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Entered as second class matter at the Post Office Dept., Ottawa, Canada. Contributors should retain a copy of contributions and include return postage. Contributions will be handled with reasonable care but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions and letter changes that are necessary. Payment made at our current rates, covers all authors', contributors' or contestants' rights, title and interest in and to accepted material, including photographs and drawings.

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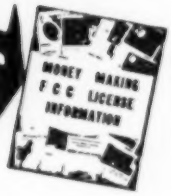

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TO TRAIN AND COACH YOU AT HOME IN SPARE TIME UNTIL YOU GET

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If you have had any practical experience—Amateur, Army, Navy, Radio repair, or experimenting.

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Ralph F. Nichols 1203 Elm St., Kerrville, Texas	2nd class telephone	34
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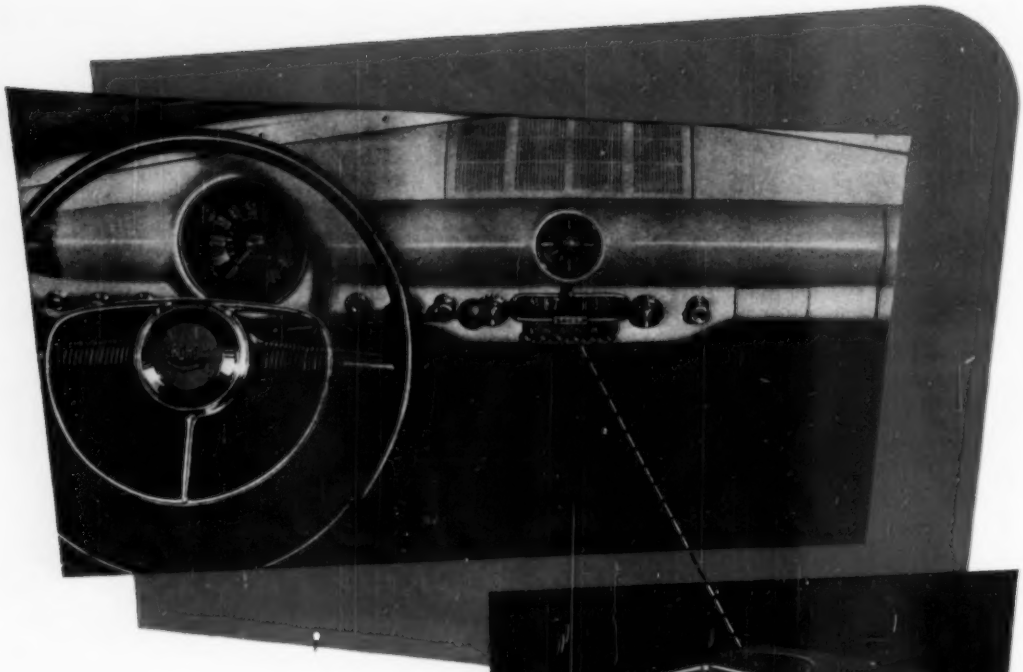

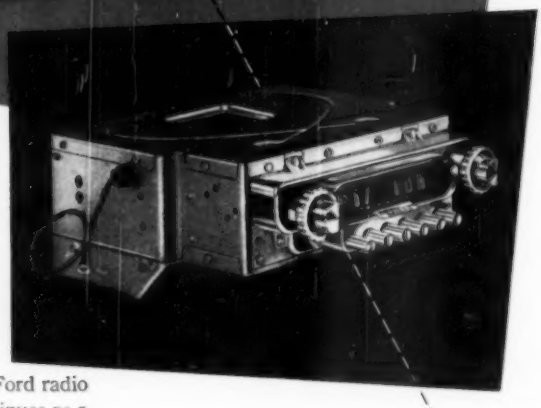

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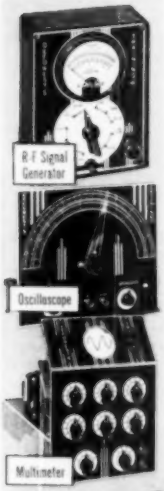

See how DeForest's Training, Inc. can start preparing you now for the opportunities ahead in TELEVISION . . . RADIO . . . ELECTRONICS. We provide practical training in your own home to help you gain the confidence and "know-how" to fit you for a responsible, well-paying job or your own business. D.T.I. trains you rapidly, thoroughly, by using modern instruction methods and equipment. Write today for free facts on how you, too, may get started toward a profitable, exciting career.

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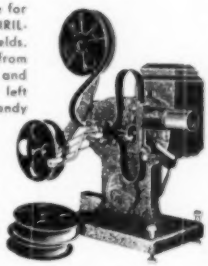

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For the RECORD

BY THE EDITOR

TV TECHNICIANS SEEK INDUSTRY COOPERATION

A SITUATION exists in the Midwest which may, or may not, be symptomatic of a condition in other areas as well, between television technicians and TV set manufacturers. In Chicago, for example, the Better Business Bureau has been flooded with complaints from television purchasers who claim that their sets do not function properly and that they are sometimes given a three-way "brush-off" by the retailer, service organization, and the manufacturer.

The Bureau, in a recent report (Vol. XXI, No. 4) states: "Specifically, these complainants allege that, when they contact the retailer for service they are referred to a service concern. The service company, in turn, then involves the manufacturer. The manufacturer, it is claimed, says the customer should 'look to the retailer' for satisfaction. Sometimes even a finance company becomes involved.

"The situation is unique in the annals of merchandising in that a servicing organization, twice removed from the manufacturer, is supposed to 'make good' on the advertised claims and promises of performance by the manufacturer.

"With the thousands of television sets sold in the Chicago area monthly, a certain number of complaints is inevitable. However, the volume of such complaints received recently indicates that too many customers feel they are not getting the quality of reception they have a right to expect from reading manufacturers' and retailers' advertising.

"In other fields, complaints to the Bureau are directed, generally, against only a few companies or individuals. In television, however, a substantial portion of the sets manufactured today are apparently involved. Most complaints have come from sources where the retailer also sells the purchaser a service contract.

"The retailer 'sublets' service to a separate organization which reportedly may not always have the same high regard or appreciation of the obligations that the manufacturers and retailers themselves naturally entertain for their respective advertising claims. Analysis indicates there are relatively fewer complaints when the retailer does his own servicing.

"When contacted by the Chicago Better Business Bureau, representatives of the great and growing television field say these complaints are the growing pains of an industry which has expanded too rapidly, and hence has not had sufficient time to acquire the proper technique for handling adjustment matters.

"They further allege that there are still an insufficient number of trained technicians for the huge volume of work required to install and service television receivers properly and hence customers expect too much in the way of both reception and service. The industry's further position is that, considering these very real problems, television is doing a remarkable job in satisfying thousands of purchasers.

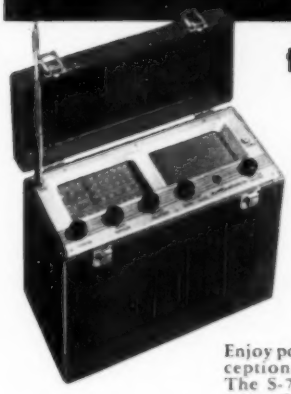
"Because many complaints from the public involve the manufacturer, retailer, and the service agency, the Bureau recommends all three collaborate more closely in sifting their causes with a view to forthright and effective action."

Television service associations in the same area are complaining bitterly against practices by the television set manufacturers in approving service companies that are not qualified to do satisfactory installation and service jobs and who establish rates which cannot permit legitimate, ethical operations. The Television Installation Service Association reports that "investigations invariably reveal that the offending companies are chiselers who are representing themselves as legitimate companies."

There are now many service organizations in our Industry doing their utmost to maintain a healthy, clean service profession for the benefit of the entire industry and the set buyers. The real solution to these problems will be achieved only when all, not just a few, manufacturers and service organizations sit down together in an honest attempt to extend their mutual cooperation.

Television — the greatest industry potential of our time—is destined to follow a most rugged trail on its way to becoming our country's accepted mass communications system, unless the TV industry itself insists that the public enjoy and benefit from properly installed and properly maintained receivers. We must have trained technicians ready to meet the ever-increasing demand for service. Our technical schools are making a real contribution to the industry by supplying qualified technicians, and even many "old-timers" have burned the midnight oil to prepare themselves and to learn the new circuitry and television techniques. These men will have ample opportunity to succeed in the TV industry, provided they are given support by the TV manufacturer. . . . . O. R.

it's ALLIED for hallicrafters!



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Shpg. wt., 16 lbs.

97-505. S-72 Portable. *Only*..... **$89.95**
$9.00 down, $7.15 monthly for 12 months

80-585. A-B Battery Pack for above. NET..... **$3.85**

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97-786. R-44B matching speaker. 19 lbs..... **$24.50**

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Examining specimen on metallographic microscope at Bell Telephone Laboratories.

Through his microscope this Bell metallurgist examines a bit of material which is proposed for telephone use. From what he sees of grain structure, he gains insight into performance not provided by spectrum or chemical analysis. He learns how to make telephone parts stand up longer, so that telephone costs can be kept as low as possible.

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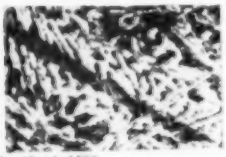
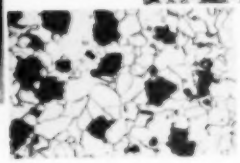
In joints and connections—soldered or welded, brazed or riveted — photomicrographs reveal flaws which would escape ordinary tests. They show if a batch of steel has the right structure to stand up in service; why a guy wire let go in a high wind or a filament snapped in a vacuum tube; how to make switchboard plugs last longer.

In their exploration of micro-structure, Bell Telephone Laboratories scientists have contributed importantly to the metallographic art. You enjoy the benefits of their thoroughgoing testing and checking in the value and reliability of your telephone system, and the low cost of its service.



Photomicrograph of white cast iron which is hard and brittle.



Same iron rendered malleable by heat treatment. Shows spots of nodular carbon.

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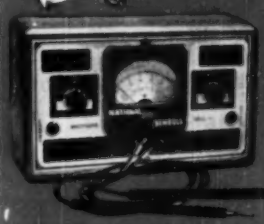

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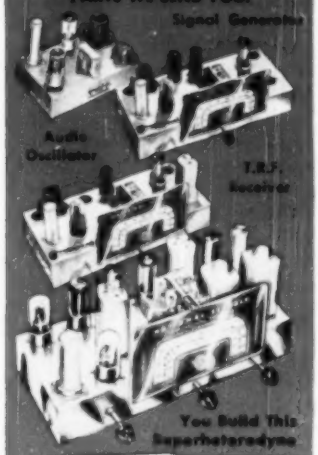

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They climbed the world's tallest tower so you could see farther

Steeplejacks at work *on an NBC television antenna—1250 feet above the sidewalks of New York. Its height gives telecasts a wider range in the New York and New Jersey area.*

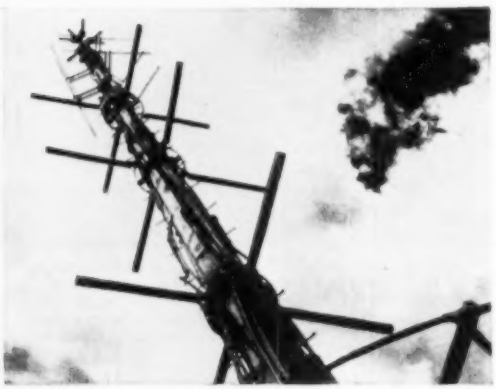
Installation of NBC's television antennas has been a job for daring steeplejacks!

No. 6 in a series outlining high points in television history

Photos from the historical collection of RCA

● Dwarfed ant-small by their height above Manhattan's streets, skilled and daring workmen—in 1931—offered New Yorkers a sight as exciting as the highwire act at a circus . . . but much more significant.

Task of these men, as they clambered about atop the tower of the Empire State Building—1250 feet in the air—was to install an antenna for experimental telecasts from NBC's television station. "Why did it have to be so high?" was a question on thousands of watchers' lips.



A familiar sight *on the New York skyline, NBC's television antenna—installed in 1946—was the successor to those erected in 1931, 1936 and 1938, and used by RCA and NBC to perfect television.*

As might have been expected, with television an unfamiliar art, the average layman thought of it in relation to radio broadcasts, whose waves he knew could circle the globe. That telecasts were fundamentally limited by the line of the horizon was little known. To increase this limiting range, scientists, engineers, and technicians, sought the highest available vantage point.

With its antenna installed, this experimental television station was able to transmit pictures a distance of about 42 miles, and farther under highly favorable conditions. Receivers dotted around the New York area picked up the first telecasts, providing encouraging and instructive information to be studied by RCA's scientists.

Facts gathered in this period included new data on the behavior of very short waves, as well as how to handle them. New knowledge about interference was acquired, including the fact *that much of it was man-made* and therefore could be eliminated.

Other studies undertaken at the time included basic work on the "definition" most suitable for regular commercial telecasts. Definition as coarse as 60-lines was used in early days. Then came 341-line, and 441, until today's standard of 525-line definition was finally adopted.

That we may now, as a matter of course, see sharp, clear pictures on the screens of our home television receivers is in good part the result of experimental work initiated by RCA scientists, and carried out by NBC engineers since the erection of the first station in the Empire State Building. A share should also be credited to the steeplejacks who climbed to dizzy heights so that you could see farther!

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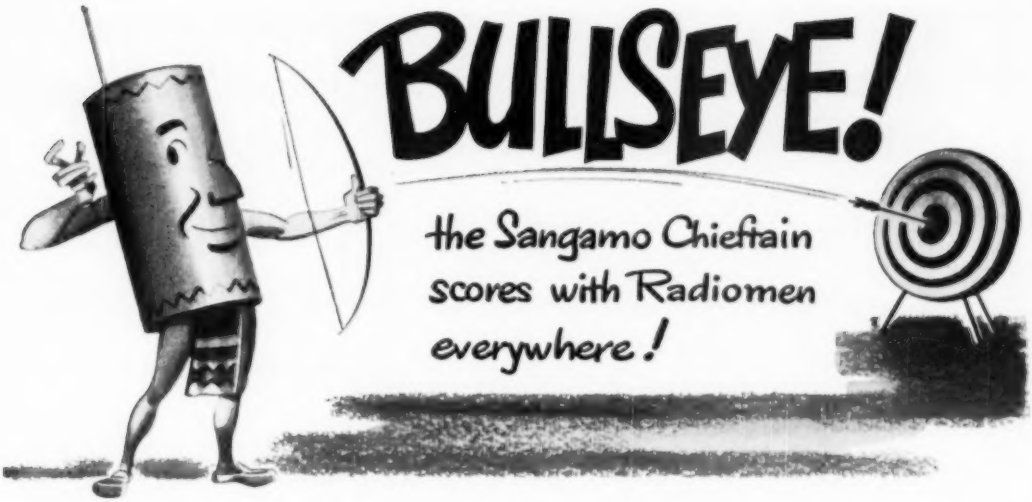

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The New RCA WR-59B TELEVISION SWEEP GENERATOR

for Visual Alignment of TV and FM IF Amplifiers and TV Front Ends

CHARACTERISTICS

FREQUENCY RANGES:

RF (TV CHANNELS 2-13): 54-60, 60-66, 66-72, 76-82, 82-88, 174-180, 180-186, 186-192, 192-198, 198-204, 204-210, 210-216 Mc.

IF: 300 kc to 50 Mc, continuous tuning. Covers video band and all intermediate frequencies for prewar and present TV picture and sound, as well as for FM radios.

SWEEP: continuously variable for both IF and RF ranges. Sweep frequency is not less than 10 Mc.

OUTPUT VOLTAGE RANGE (RMS) . . . 0.1 volt to 5 microvolts.

OUTPUT IMPEDANCE (AT CABLE TERMINALS): RF RANGES: 300 ohms balanced IF RANGE: 100 ohms

MAXIMUM ATTENUATOR RATIO: RF RANGES: 20000 to 1 IF RANGE: 4000 to 1

MAXIMUM AMPLITUDE VARIATION OF SWEEP ENVELOPE: All ranges, less than ± 1.5 db

HORIZONTAL SWEEP FOR OSCILLOSCOPE: Phase Range, 0°-160°; frequency, power line

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. . . ***FOR CONVENIENCE***—you get the choice of a balanced or unbalanced output for rf work—a separate output for if work.

. . . ***FOR DEPENDABILITY***—you get fundamental oscillator signals on all TV channels; and filtered beat-frequency fundamentals on if vf range.

. . . ***FOR TV TROUBLE-SHOOTING AND ALIGNMENT***—you get all the sweep signals you need with the WR-59B BLUE RIBBON Television Sweep Generator.

DESIGNED FOR THE TV SERVICEMAN

DESCRIPTION

The RCA WR-59B Television Sweep Generator is designed for the aligning and the general servicing of television and FM receivers. Used with an oscilloscope, this instrument will provide a pattern on the oscilloscope screen representing the response curve of the circuit under test.

The WR-59B Television Sweep Generator will furnish a wide-band frequency-modulated signal to cover each of the 12 standard television channels as well as all other frequencies between 300 kc and 50 Mc. The frequency width of the sweep may be controlled for each position.

The output from the RCA WR-59B is frequency-modulated at the fundamental frequency by a precision-type vibrating capacitor. The moving element of the capacitor is suspended by beryllium-copper corrugated straps. This design insures long life, good linearity, and a wide sweep range. Both rf and if-vf outputs are essentially flat over all sweep ranges. The output signals are free from spurious responses and other frequency components, such as are characteristic of unfiltered beat-frequency oscillators and harmonic generators. The if-vf output is obtained by mixing the output of the sweep oscillator with the output of a variable-frequency oscillator and passing the result through a low-pass filter to provide a clean fundamental-frequency signal.

In addition, the WR-59B features a blanking circuit which produces a zero-reference line on an oscilloscope. This base line, the point of zero signal from the Sweep Generator, is exceedingly helpful in aligning television and FM discriminator circuits, in checking phase adjustments, and in determining the slope of the frequency-response curve.

The WR-59B also provides a phase-controlled sweep voltage at power-line frequency, which may be applied to oscilloscopes lacking a phase control or a sync control.

The RCA WR-59B Television Sweep Generator is a light-weight, compact, and versatile instrument. It can be employed in any application which requires a frequency-modulated signal of 0.1-volt down to 5 microvolts and within the frequency range of the instrument. Used in conjunction with the RCA WR-39B Television Calibrator and an oscilloscope, it will provide outstanding facilities for aligning and servicing television receivers.

The WR-59B is supplied complete with IF-VF Output Cable, RF Output Cable, Power Cord, 2 Binding Post Pin Plugs, warranty certificate, and instruction book.

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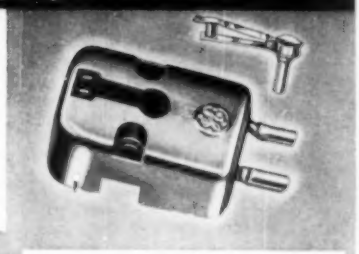

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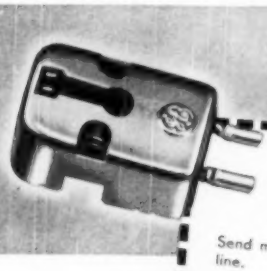

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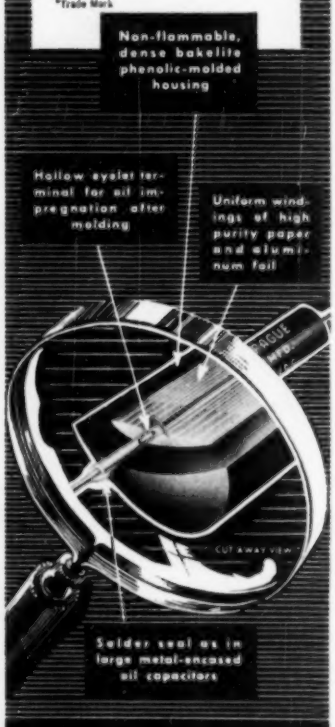

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Spot Radio News

★ *Presenting latest information on the Radio Industry.*

By RADIO & TELEVISION NEWS' WASHINGTON EDITOR

THE TRI-COLOR ERA of TV, the official beginning of which has been a pet topic of the largest collection of armchair-expert forecasters on record, is now well on its way to receiving a well-documented sanction, with the end of the summer offered as the period when the fully-authorized inaugural-date news will be released.

Preparation of a lengthy notice from government headquarters, requesting detailed findings and conclusions from the three proponents of color, *RCA*, *CBS* and *CTI*, before the summer is in full swing, and subsequent comments by Congressional committeemen specializing in broadcast legislation, have been cited as the clues to the anticipated decision.

The lengthy notice should provide the answer, for the color experts were asked to supply an encyclopedic array of data, which the FCC felt would surely produce the key facts as to when we should have color and what kind or what system should be approved. Specifically, here is what the Commissioners asked the color scientists to disclose:

A complete description of the receiving and transmitting setups, with an analysis of the over-all picture quality; brightness; color breakup and fringing; color fidelity and color contamination; contrast; picture texture; flicker, dot crawl, line crawl, etc.; picture size limitations; viewing angle and distance; registration; vertical and horizontal resolution. In addition, the government men wanted to know when the transmitters and receivers might be available for color, what the cost would be not only for the original package, but for maintenance. They were also interested in being told about the possibilities of network transmission, including the capability of transmission over existing and proposed network facilities. Convertibility of existing receivers to receive color represented another vital factor in which they were concerned. In this instance, the Commissioners wanted to know just what types of converters would be necessary, their possible cost, how much it might cost to maintain them, when they would be available, what types of production schedules can be planned. The FCC men also asked whether existing receivers might be able to receive color transmissions, if relatively minor modifications were to be effected.

An extensive set of queries concerning black and white reception on color models was also included, the questions, in the main, duplicating those involving the color sets.

Interference received substantial coverage in the questionnaire, too, data requested covering co-channel interference, adjacent channel interference, oscillator radiation interference or other in-channel interference such as diathermy harmonics and other station harmonics including interference to any subcarrier employed in the system, image interference, noise, ghosts, and ignition interference.

Field tests and public-reaction tests were also subjected to a quiz, proponents being asked to provide a summary of all such tests, and a statement of the adequacy and weight which might be given to these tests in setting up standards.

In a section devoted to proposed conclusions, the FCC asked for a precise statement of the specific transmission standards proposed; the rules and regulations suggested; and recommendations as to the policies with respect to compatibility; convertibility; patents; the desirability or undesirability of promulgating color standards at the present time in the light of the development of the art; the minimum and maximum hours of color telecasting; and the handling of the transition from the present situation in TV broadcasting to color transmission. Also asked for was a statement covering the social value and economic cost to the American public of the adoption of any specific system at this time or at a later time.

Many days, perhaps weeks, will be required to present and discuss this voluminous assortment of information. But the time will be well spent, for this library of facts should contain the solution to industry's most complicated mystery.

CLUES as to what might appear in many of the answers in FCC's comprehensive fact-finding notice were heard on the witness stand, as the color hearings began to draw to a close. Among those presenting these particularly important answers were *RCA's* board chairman, Brig. Gen. David Sarnoff,

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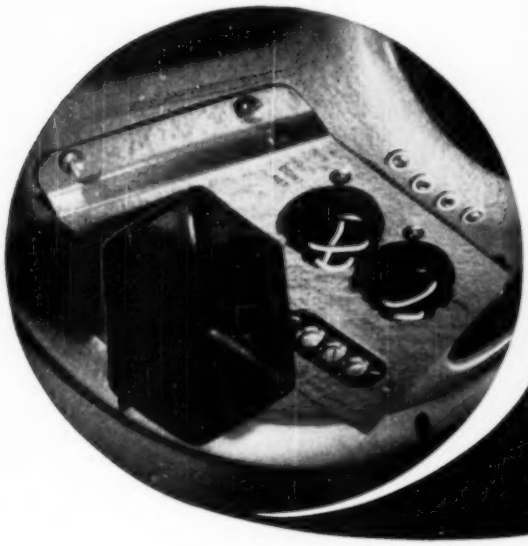

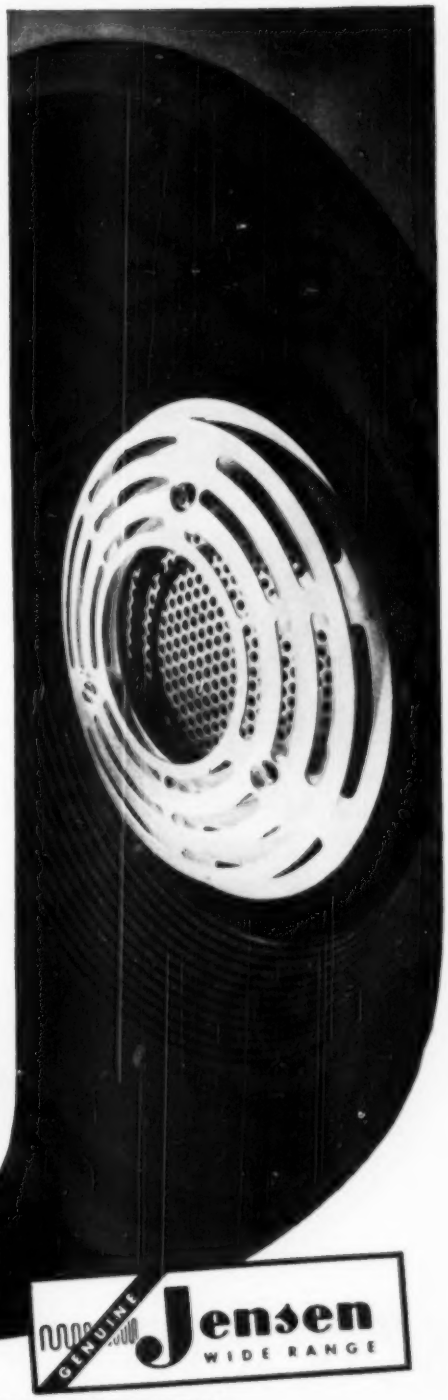

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whose testimony and official policy statements had been sought eagerly by the Commission and especially by the FCC legal staff. The General offered an extensive report which crackled with caustic comments about the merits of the color systems offered by *Columbia* and *Color Television*.

Slashing away at the *CBS* method, General Sarnoff declared that: "The adoption of the *CBS* system, whose obsolescence is already foreshadowed in this fast developing electronic art, would earn the scorn of the world. At the very moment I am appearing before you, the United States delegates are at a meeting of the International Consultative Committee in London to advocate world-wide television standards on a basis equivalent to the present American black-and-white standards. For this Commission to degrade the standards of American television by adopting the inferior *CBS* system only would be to show the world that we do not have any faith in the standards which our State Department is recommending to the world. . . . Adoption of the *CBS* system exclusively would also earn the dissatisfaction of American families. They would be induced to buy *CBS* type sets by a decision of this Commission made at a time when it was evident that *CBS* itself would shelve its mechanical system, in favor of an all-electronic system."

General Sarnoff emphasized that there was no doubt about the desirability of color for television, but there now existed a fundamental issue to solve, and that issue was . . . "Shall American television move forward or backward?" Elaborating on this point, the General said: "*CBS* has asked this Commission to adopt a system which would saddle an all-electronic art with a mechanical harness. You are being urged by *CBS* to build a highway to accommodate the horse and buggy, when already the self-propelled vehicle is in existence and has been demonstrated."

And then the *RCA* Headman went on to say that . . . "On the other hand, the Commission is asked by *RCA* to adopt color television standards which will permit the utilization of an all-electronic, compatible color television system, which does not have those defects and which has picture quality at least equal to that provided by existing black and white standards."

The Commissioners were told that *RCA* had demonstrated that their system . . . "has the full geometric resolution of existing black-and-white standards . . . and color fidelity equal to that of any other system and we expect this to be further improved."

Continuing his acid attack of *CBS*, the *RCA* Board Chairman declared that *CBS* . . . "have been trying desperately to improve the quality of their picture and to increase their picture size. They have borrowed dot interlace from the *RCA* system in their effort to increase the defintion of their pictures. They testified that they look forward with anticipation to use of the *RCA* single tri-color picture tube in order to eliminate their mechanical disc. They say now that, with the use of dot interlace, the quality of the *CBS* pictures will be improved."

Reviewing the requirements, which it was believed color TV standards should meet, the General offered three basics: Channel width of six megacycles; color pictures, by whatever system transmitted or received, which should not be inferior in quality and definition to present black and white pictures; and a color system which should be compatible with existing black and white standards.

"Broad standards based upon these requirements will enable color television," the General continued, "to move forward as a service to the public . . . In my judgment, a color television system that does not meet these broad standards will not be acceptable to the public and should not be approved by the Commission."

Then the General offered the information for which the FCC had pleaded in earlier sessions, information disclosing the plans *RCA* would follow under any one of five different decisions the FCC might make in settling the color question.

"If the Commission were to adopt the *CBS* proposal only," *RCA's* spokesman said, "we would be confronted with a field-sequential color system . . . which is non-compatible. . . . We would then find ourselves saddled with a system which we firmly believe is inadequate . . . and which we seriously doubt would prove acceptable to the public. . . . Under these hypothetical circumstances, *RCA* would . . . make and sell transmitting equipment, on order to anyone; make and sell tubes, including our tri-color picture tube, and parts to anyone; make and sell field-sequential color receivers, utilizing the tri-color tubes, as the public demand for such receivers might exist; make and sell tri-color tube converters on the same basis; and make and sell separate adapter units for television sets already in the hands of the public, as well as for new sets thereafter manufactured."

Describing the problem of adapters, the General declared that *RCA* would not build adapters in their sets at the factory. Explaining this point, he said . . . "It has been estimated that the present annual production of television receivers is at the rate of five million a year. With an estimate minimal figure of $20 for built-in automatic adapters, the public would have to pay more than $100,000,000 a year for an adaptation to a degraded system which is non-compatible."

Detailing the virtues of the recently-demonstrated color tube, the General declared that the company had such confidence in the tube that they were prepared to manufacture them on a wide scale, with mass production a certainty in a year from now.

Were standards to be authorized, the

(*Continued on page* 112)

Train at Home in Spare Time for RADIO and TELEVISION

I Send You 18 BIG KITS OF RADIO-TELEVISION EQUIPMENT

VETERANS: My Radio Training is Approved for Veterans.

IF YOU ARE EXPERIENCED in Radio I'll qualify you for Television in 4 to 8 weeks. Rush coupon.

My Famous Training System Prepares You in Double-Quick Time for a Good Job or Your Own Profitable Radio-Television Business

Radio-Television is now America's greatest opportunity field! Trained men are needed to fill good jobs and handle profitable Radio-Television Service work. I have trained hundreds of men for success in Radio-Television—and I stand ready to Train you too, **even if you have no previous experience.** My training is 100% practical—designed to give you the knowledge and experience you need to make money in Radio-Television in the shortest possible time. I Train you with up-to-the-second revised lessons—PLUS many big kits of Radio-Television equipment. You actually do over 300 demonstrations, experiments and construction projects. In addition, you build a powerful 6-tube 2-band radio, a multi-range test meter and a complete Television receiver! All equipment is YOURS TO KEEP.

EASY TO MAKE EXTRA MONEY WHILE YOU LEARN

You do all your training with me AT HOME in spare hours. Keep right on with your present job and income while learning—and earn extra cash besides! The day you enroll I begin sending you plans and ideas for doing profitable spare-time Radio-TV work. Many of my Sprayberry students pay for their entire training this way! You get priceless experience and many plans for making extra money. You build all your own Radio-TV Test Equipment from parts I send you—nothing else to buy. Just one more reason why I believe I offer the ambitious man the biggest value in top notch Radio-TV Training available anywhere in America today.

Be Ready for Top-Paying Radio-Television Jobs

Radio-Television is growing with amazing speed. More than 2000 Radio broadcasting stations PLUS an additional 102 Television stations are now on the air. Radio sets and TV receivers are being made and sold in record-breaking numbers. If you enjoy working with your hands . . . if you like to do interesting and varied work . . . if you really want to make good money and work in an industry that has a future . . . YOU BELONG IN RADIO-TELEVISION. But you MUST have good Training to "cash in" . . . the kind of Training that starts you out with basic fundamentals and carries you right through every circuit and problem of Radio-Television Servicing and Repair. In a word . . . that's Sprayberry Training . . . the course backed by more than 28 years of association with the Radio-Television industry!

FREE 3 BIG RADIO-TELEVISION BOOKS

I want you to have ALL the facts about my complete system of Radio-Television Training! Act now! Rush the coupon for my three big Radio-Television books: "How to Make Money in Radio-Television," PLUS my new Illustrated Television Bulletin PLUS an actual sample Sprayberry Lesson—all FREE with my compliments. No obligation and no salesman will call on you. Send the coupon in an envelope or paste on back of post card. I will rush all three books at once!

Sprayberry Academy of Radio, Dept. 25-L
111 North Canal St. Chicago 6, Ill.

Mail Coupon Today!

NO OBLIGATION
No Salesman Will Call

SPRAYBERRY ACADEMY OF RADIO, Dept. 25-L
111 North Canal St., Chicago 6, Ill.

Please rush to me all information on your Radio-Television Training Plan. I understand this does not obligate me and that no salesman will call upon me.

Name ..... Age .....

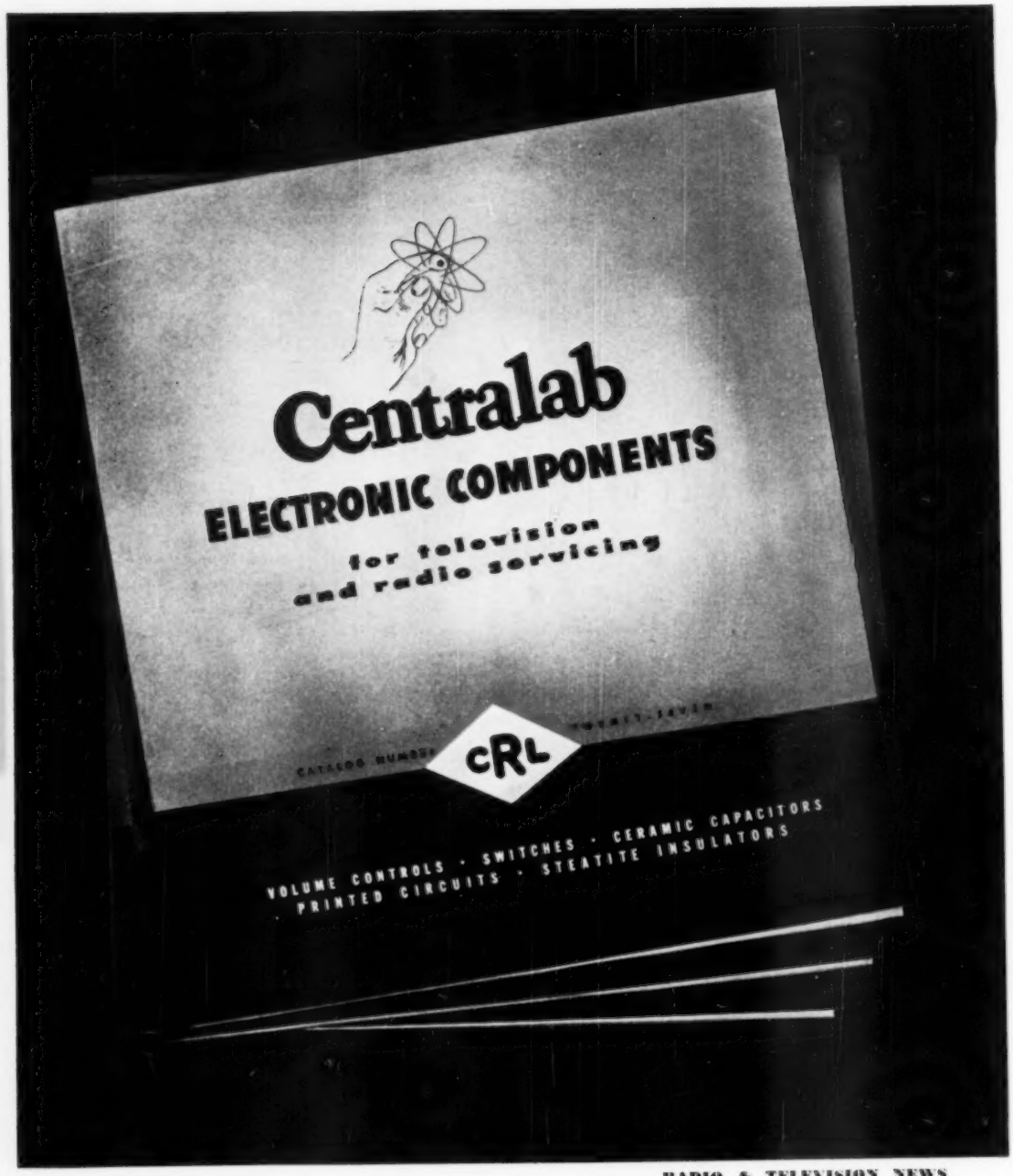
Address .....

City ..... Zone ..... State .....

Please Check Below About Your Experience

☐ Are You Experienced? ☐ No Experience

Your New Centralab



Catalog is Ready!

Just off the press . . . Centralab's new service catalog . . . *Many new* . . . never before available Centralab components . . . *new* ceramic capacitors . . . *new* controls . . . *new* steatite insulators . . . *new* printed electronic circuits . . . *send in the coupon* . . . get your copy without delay.

CATALOG FEATURES THAT WILL HELP YOU

- Centralab's TV Control Replacement Plan — really "hot" for today's service problems.
- Shows most complete line of ceramic capacitors in industry — higher voltages and higher capacities not previously available.
- 3 full pages of famous Centralab "Printed Electronic Circuits" — now you can buy them! A complete line from small plates to complete speech amplifiers.
- New CRL "BLUE-SHAFT" volume controls — a new line for TV-AM-FM service — factory assembled, tested and guaranteed. 15/16" diameter. Ready to use — no time lost fussing with assembly.
- New kit packages — for volume controls, switches and capacitors. Handy!
- Famous CRL Steatite insulators — A line you've always wanted — now you can get them — the best ceramic insulators anywhere — bar none!

All this and More to help you do better, safer servicing.
Bound into 24 big easy-to-read, easy-to-order from pages!

Centralab
CRL
Division of GLOBE-UNION INC., Milwaukee

FILL OUT — TEAR OUT — MAIL TODAY!

CENTRALAB DIVISION, Globe-Union Inc.
910 E. Keefe Ave., Milwaukee 1, Wis.
Please send me my copy of the new Centralab Catalog No. 27 at once and without charge.

Name .....

Address .....

City ..... State .....

Company ..... Check One—My Own ☐
Work For ☐

We will appreciate it if you tell us — name of principal distributor you do business with —

Name .....

Address .....

City ..... State .....

the New
PYRAMID
"Humidi-Seal"
(TUBULAR PAPER CAPACITOR)

Type 85TOC "Humidi-Seal" capacitors are specially designed for 85° C. operation, even in the most humid atmospheres, and will meet the severe present-day demands of endurance in television receivers, auto radios, etc.

WRITE FOR COMPLETE LITERATURE

Representatives and Distributors throughout the U.S.A. and Canada

PYRAMID

PYRAMID ELECTRIC COMPANY
155 Oxford Street
Paterson, N. J., U.S.A.
TELEGRAMS: WUX Paterson, N. J.
CABLE ADDRESS: Pyramiduse

Within the INDUSTRY

WILLIAM T. BEAN, JR., has been named director of the newly-created Technical Service Center of *Industrial Electronics, Inc.* of Detroit.

Mr. Bean, until recently a consulting engineer for several of the leading heavy industries, is a graduate of the University of Oklahoma. He has been associated with *Skelly Oil Company* and *National Supply Company.*

In 1940 he joined the faculty of Purdue University where he taught aircraft engine design and basic mechanical engineering. He returned to industry in 1943 as research engineer in charge of stress analysis for *Continental Aviation and Engineering* in Detroit. He also served as project engineer on air-cooled engine development for Army Ordnance.

In his new position Mr. Bean will continue his activities in stress analysis.

* * *

SCOTT RADIO LABORATORIES, INC., recently named a new slate of directors and two new officers at a special meeting of shareholders.

New directors of the firm are John S. Meck, Leslie Evan Roberts, Russell G. Eggo, and F. W. Adams. Remaining on the five man board is H. S. Darr, former president of the firm.

Mr. Meck was elected president of the firm on April 17th after he purchased large holdings in the company. At the special meeting Mr. Roberts was named vice-president and Paul Schuecking was re-elected comptroller. Other new officers of the firm include Mr. Adams as vice-president and general counsel; Mr. Eggo as secretary, and G. F. Meck as treasurer.

* * *

RADIO CORPORATION OF AMERICA has purchased a new building which will provide an additional 126,000 square feet of space for the expansion of electron tube manufacturing facilities at its Harrison, New Jersey plant . . . **SYLVANIA ELECTRIC PRODUCTS INC.,** has temporarily reopened its radio tube plant in Altoona, Pa. . . . **EAGLE ELECTRIC MFG. CO., INC.,** has moved its Chicago office and warehouse to larger quarters at 311 N. Desplaines Street . . . **SQUARE ROOT MANUFACTURING CORPORATION,** makers of built-in and outside TV antennas, has recently purchased a 30,000 square foot plant at 391 Saw Mill River Road, Yonkers, New York . . . Plans to double radio and television production were recently disclosed by the announcement of **SENTINEL RADIO CORPORATION** that ground has been broken for a new building in Evanston which will add 25,000 square feet of manufacturing space . . . **TELEQUIP RADIO COMPANY** has moved its plant to new quarters at 2559 W. 21st Street, Chicago. The new plant will triple the company's television production capacity . . . **CONCORD RADIO CORPORATION** has centralized its mail order headquarters at 901 W. Jackson Blvd., Chicago 7, Illinois . . . To offset the bottleneck in powdered cores used in horizontal output transformers, deflection yokes, etc. the **HENRY L. CROWLEY COMPANY** has expanded facilities at its West Orange plant and has opened a new plant at Cleveland, Ohio . . . **SYLVANIA ELECTRIC PRODUCTS INC.,** has consolidated its New York offices in a new headquarters at 1740 Broadway . . . **TELE-MATIC INDUSTRIES, INC.,** manufacturers of TV antennas, accessories, and components, has moved to new and larger quarters at 1 Joralemon Street, Brooklyn 2, New York . . . **CREST TRANSFORMER CORPORATION** has taken over the entire building located at 1834 W. North Avenue in Chicago in order to double production facilities . . . The executive and sales offices of **TEL-O-TUBE SALES CORPORATION** have been moved to new and enlarged quarters at 580 Fifth Avenue, New York 18 . . . **SPELLMAN TELEVISION CO., INC.,** has acquired new quarters at 3029 Webster Avenue in the Bronx . . . The **DUO-TONE COMPANY, INC.,** has moved its offices to larger quarters at Locust Street in Keyport, N. J. . . . The Cincinnati District Office of **TINNERMAN PRODUCTS, INC.,** has been moved to the Roselawn Center Building, 1717 Section Rd., Cincinnati 37, Ohio . . . **CALIFORNIA CHASSIS CO.** has moved into its new building at 5410 Tweedy Blvd., South Gate, California . . . **STANDARD COIL PRODUCTS CO., INC.** of Chicago, Los Angeles, and Bangor, Michigan, has opened a new branch sales office at 1616 Walnut Street, Philadelphia 3, Pa. . . . **PHOENIX ELECTRONICS, INC.** has added 3000 square feet of manufacturing area to its plant at Lawrence, Massachusetts . . . **TELREX INC.** of Asbury Park, N. J., has acquired a new testing site on which it is constructing a fully equipped laboratory. The three-acre tract is located in Belmar, New Jersey . . . **NIZE MANUFACTURING CO., INC.,** manufacturers of radio and TV accessories, has moved to new and larger quarters at 550 Westchester Avenue, Bronx 55, New York . . . 78,000 additional square feet of floor space has been acquired by **STARRETT TELEVISION CORP.** in its

Now-Rauland Ends Annoying Tube Face Reflections

New Etched Face Increases Viewing Ease and Pleasure

Rauland is proud to announce the solution of one of Television's most stubborn picture problems—the reflection of room lights, windows and other light sources back to the eyes of the viewer.

Attempts have been made, with only partial success, to solve this problem by tilting the glass face-plate so that its reflections are angled below the viewer's line of vision. Reflections from the curved tube face itself obviously could not be eliminated by this means.

Now Rauland has attained a full solution of the problem by a process which leaves the tube face with a satiny, non-reflecting surface. In combination with a tilted face plate, reflections are effectively eliminated. Even a bright, unshaded light held beside the viewer at normal viewing position produces no disturbing "hot spot" in the television picture.

Rauland is happy to contribute again to the television industry by making possible viewing ease and comfort beyond anything known heretofore. This new reflection-proof face is available now in many of the tube types produced by Rauland.

THE RAULAND CORPORATION

Perfection Through Research

4245 N. KNOX AVENUE · CHICAGO 41, ILLINOIS

DON'T MISS THIS MARKET

DON'T MISS THESE PROFITS

DON'T MISS

Callmaster

ELECTRONIC
2-WAY COMMUNICATOR

Right now, the moderate-price Communicator market is wide open . . . offers tremendous activity . . . continuing, excellent profits to merchandisers who promote it . . . with the **right** product, at the **right** price!

Callmaster meets every requirement of this rich market . . . it's **right,** it's **ready,** to help you get your share.

PRICE . . . $39.95 complete set (above) . . . ready to connect . . . no "extras."

PERFORMANCE . . . perfect sound fidelity . . . even a whisper is received clear and true.

PROFIT . . . generous profit margin . . . quantity discounts.

SIZE . . . compact . . . 7"x5½"x3½" . . . less desk space than 'phone.

APPEARANCE . . . lustrous, mahogany-grain plastic cabinet . . . extra-thick, electric-shock proof. Bakelite control knobs.

PRECISION BUILT . . . engineered to rigid specifications. All components high quality. No "surplus" materials used.

INSTALLATION . . . easier to hook-up than standard door-bell system.

SERVICE . . . durable, rugged . . . doesn't have to be "babied." RMA warranty.

COMPLETE LINE. . . Master and sub-station sets. Selective Masters for multi sub-station operation. All-Master systems.

DEALERSHIPS . . . available.

DISTRIBUTORSHIPS . . . some still open.

WRITE TODAY . . . on company letterhead, for complete information.

WM. M. SMITH COMPANY
National Sales Office
20 FERGUSON AVE., BROOMALL, PA.

Starrett-Lehigh Building. Three new assembly lines will occupy the newly-leased space . . . **ERIE RESISTOR CORPORATION** has purchased a new building for its plastics division which will give that division better than two and a half times the space it now occupies.

* * *

MAX F. BALCOM was elected chairman of the board of *Sylvania Electric Products Inc.*, to succeed the late Walter E. Poor.

In addition to elevating Mr. Balcom, the board of directors also named Frank A. Poor, founder of the company, as vice-chairman of the board. Three new directors were elected at the same meeting: Edward J. Poor, who resigned as chairman in 1943; Richard L. Bowditch, president of *C. H. Sprague & Son Company;* and H. Ward Zimmer, vice-president in charge of operations.

Mr. Balcom has been associated with *Sylvania* since 1918. He has long been active in various radio industry activities. He was president of RMA in 1948 and 1949 and is presently chairman of the Association's television committee.

* * *

NOBLITT-SPARKS INDUSTRIES, INC., which manufactures a full line of home radios and television receivers in addition to electric housewares, car heaters, etc., has changed its corporate name to *Arvin Industries, Inc.*

According to Q. G. Noblitt, chairman of the board and co-founder of the company, the new move is designed to permit the company to capitalize on its brandname to the fullest extent. The company's policies, products, and operations will not be affected by the name change, according to Mr. Noblitt.

The company operates eleven plants in five central Indiana towns with main factories and executive offices in Columbus, Indiana.

* * *

JOHN H. GANZENHUBER, formerly manager of broadcast sales for *Western Electric Company,* has been appointed vice-president in charge of sales and product development for *Standard Electronics Corporation* . . . **ROBERT J. CANNON** has been named president and treasurer of *Cannon Electric Development Company* of Los Angeles, succeeding his father, the late James H. Cannon, former president and founder . . . **CAXTON BROWN** has retired as the chairman of the executive committee of *Weston Electrical Instrument Corporation* but will retain his post on the board of directors and will be available to the corporation as a consultant. He has been with the company since 1901 . . . **CARL E. SCHMITZ,** vice-president and director of engineering of *Crane Packing Company* of Chicago, was recently elected vice-president-at-large of the American Society of Lubrication Engineers . . . **WILLIAM W. STIFLER, JR.** has joined the application engineering staff of the *Sprague Electric Company* of North Adams, Massachusetts . . . **W. F. BARNES, JR.** has been appointed to the post of regional sales manager for the Magnetic Recording Division of *The Brush Development Co.* of Cleveland . . . **SAM NORRIS** has been elected president of *Amperex Electronic Corporation* of Brooklyn. He was formely executive vice-president of the firm . . . **JOSEPH W. CROWNOVER** has been named section chief in charge of the experimental and research electronics laboratory at the *Electrical Reactance Corp.* of Franklinville, New York . . . *Philco Corporation* has promoted **JOHN F. GILLIGAN** to the post of vice-president in charge of advertising. **HENRY T. PAISTE, JR.** as vice-president in charge of service and quality, and **RAYMOND B. GEORGE** as vice-president in charge of merchandising for the television and radio division . . . **A. S. JOHNSON** is the new general manager of the National Carbon Division of *Union Carbide and Carbon Corporation* . . . **G. EDWARD DE NIKE** is the new manager of Teletron Sales for the *Allen B. Du Mont Laboratories* . . . *Electro-Voice, Inc.* of Buchanan, Michigan has named **HOWARD T. SOUTHER** to the post of manager of its new speaker division . . . **JACK PETTERSEN** has been named assistant advertising manager of *Motorola Inc.* . . . **J. E. TEMPLETON,** manager of the Los Angeles branch of *P. R. Mallory & Co., Inc.* has been named to succeed **WALTER HARVEY** who is retiring as manager of the company's wholesale division . . . **W. E. McWHORTER** has been promoted to the post of advertising manager of *Owens-Illinois Glass Company's Kimble Glass Division* . . . **BERT CONWAY** was elected to the new post of executive vice-president by the board of directors of *Aerovox Corporation* . . . The duties of advertising manager of *General Electric Company's Tube Divisions* will be handled by **G. A. BRADFORD** . . . **A. C. LINDQUIST** has been named manager of Sound Products by the *RCA Engineering Products Department* . . . **JOHN P. SHERIDAN** is the new Washington engineering representative of the *Sprague Electric Company* . . . *Westinghouse's* TV-Radio Division in Sunbury, Pa. has named **A. EARLE FISHER** as merchandise manager . . . **ROBERT F. HERPICH** has joined the engineering staff of *Telrex, Inc.* as an industrial engineer . . . **SAM AUERBACK** has been named general manager of the newly-formed Chicago sales branch of *Stewart-Warner Electric,* the radio and TV division of *Stewart-Warner Corporation* . . . **WILLIAM A. MUSSEN** has been appointed supervisor of the electronics laboratory at *Southwest Research Institute* . . . **JAMES C. SMITH** is the new industrial sales manager of *Potter & Brumfield* . . . Appointment of **VINTON K. ULRICH** as manager of the Renewal Tube Sales Division has been revealed by *National Union Radio Corporation.* —30—

SALES POWER?

"Plenty . . . with the G-E monogram on the job!"

"ANOTHER way to put it is *acceptance.* 'G-E' on my store window, on tube cartons, makes my customers want to buy!" Testimony like this is common when radio-TV servicemen talk shop. They've found — sales have shown them — that it's easy to market a tube product known favorably to millions. Just as *your* income, once you handle General Electric tubes, climbs because your public is presold on G-E quality and value! . . . And you get plenty of help in acquainting prospects with your expert service facilities, as well as with your complete line of G-E tubes. General Electric signs, advertising aids, other attention-getters do an overtime job of bringing business to your door. Your G-E tube distributor will be glad to review for your benefit the folder describing the many colorful, effective, *tested* G-E sales helps, each a signpost along your road to bigger tube profits. See him today! *General Electric Company, Electronics Department, Schenectady 5, New York.*

You can put your confidence in —

GENERAL ELECTRIC

ONE SOURCE for all your tube requirements—metal and glass tubes; miniatures; TV picture tubes in a wide range of sizes and types; also germanium diodes and selenium rectifiers. General Electric's line is complete! G. E.'s list of types includes newest tube designs for new radio-TV receivers! . . . Stock G-E 100-percent, to simplify ordering — to benefit from unit deliveries — to profit from General Electric tube quality and product popularity!

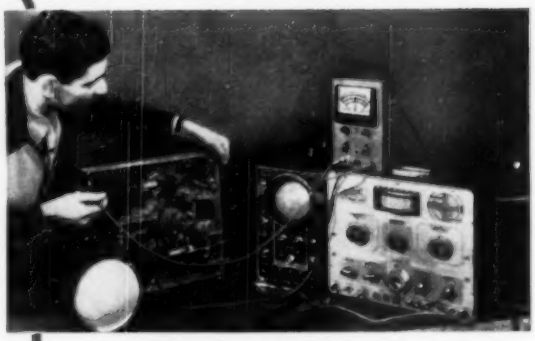
Become an Electrical Engineer

☆

Major in Electronics

☆

B.S. Degree in 36 Months



A VALUABLE FEATURE of this educational program is the manner in which LABORATORY experience is woven into *each* successive term to assure a thorough, practical background. You receive electrical practice and technical studies *immediately*. You train with modern equipment such as you will use after graduation.

"HUMAN ENGINEERING" is essential to the full success of tomorrow's technical man. Therefore, courses also include combinations of English, Economics, Engineering Law, Industrial Psychology, Speech and other Humanities.

Prepare Here for Specific Career-Objectives

Your success in the expanding, fascinating field of Electronics will be influenced materially by the type of educational program you choose.

Important advantages are gained at this Technical Institute and College of Electrical Engineering. For example, you achieve the Technician's occupational certificate upon completion of your first level of study toward a B.S. degree. The *comprehensive* nature of the courses gives you other special advantages in securing positions such as are listed below:

☐ **Major in Electronics**
B. S. Degree
(36 successive months of study which include the 12-month Electronic Technician program)

Typical job objectives:

- Design Engineer
- Electronics Research Engineer
- Radio Engineer
- Sound Engineer
- Application Engineer
- Field Engineer
- Patent Attorney (with additional training in law)
- Salesman of Electronic Equipment
- Manufacturing Supervisor
- Communications Engineer
- Industrial Electronics Engineer
- Television Engineer

☐ **Electronic Technician**
(12 months of objective study which also completes a third of the program leading to the B.S. degree)

Typical job objectives:

- Laboratory Technician
- Electrical Tester (radio mfg.)
- Maintenance and Repair Technician
- Contractor
- Manufacturing Supervisor
- Salesman of Electronic Equipment

☐ **Radio-Television Technician**
(18 months of study)

Typical job objectives:

- Radio-Television Serviceman
- Audio, Transmitter or Communication Technician.
- Broadcast Operator (upon passing FCC examinations)

THIS world-famous course in Electronics presents thorough technical training plus a solid education in the basic sciences, electrical engineering and allied fields. You have an opportunity to save a valuable year by using the option to study the year-round. Thus, you earn your B.S. degree in 36 months.

MILWAUKEE SCHOOL of ENGINEERING

Technical Institute • College of Electrical Engineering

- The 1,555 students enrolled in this 47-year-old school represent 48 states and 25 countries. Over 35,000 alumni. Terms open Oct., Jan., April, July.
- Military, practical or prior academic training will be evaluated for advanced credit. Preparatory and refresher courses are also available.

Write or send coupon today for the helpful 44-page pictorial bulletin, "Your Career," and the 110-page catalog.

MILWAUKEE SCHOOL OF ENGINEERING
Dept. RN750
1020 N. Broadway, Milwaukee, Wis.

Without obligation send the 44-page "Your Career" bulletin and 110-page catalog.

(Check 6 to 36-month courses which interest you)

Electrical Engineering: ☐ Electronics ☐ Electrical Power

☐ Radio-Television ☐ Heating ☐ Refrigeration
☐ Air Conditioning ☐ Electricity ☐ Welding

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

☐ Check if World War II Veteran

YOU BUILD 'EM IN ONE EVENING BUT...

THEY LAST A LIFETIME!

SAVE 50% WITH LABORATORY PRECISION EICO INSTRUMENTS & KITS

ANYONE CAN BUILD THEM!

SENSATIONAL NEW
EICO Model 360-K TV-FM SWEEP SIGNAL GENERATOR

$29.95

• Crystal marker oscillator with variable amplitude. • Covers all TV and FM alignment frequencies between 500 kc. and 228 mc. • Sweep-width variable from 0-30 mc. with mechanical inductive sweep. • Extremely wide sweepwidth allows gain comparison of adjacent RF TV Channels. • Provides for injection of external signal generator marker. • Phasing control included. • Large, easy-to-read dial is directly calibrated in frequencies. Vernier tuning condenser. Comes complete with all tubes (including new, high-frequency miniature types): 6X5GT, 12AU7, two 5C4's. Crystal not included. 10"x8"x6¼". 5 Mc. Crystals available for above, each $3.95.

FACTORY-WIRED AND TESTED
Model 360. Ready to use Sweep Signal Generator **$39.95**
See it at your local jobber!

NEW! MODEL 320-K SIGNAL GENERATOR

$19.95

For FM, AM alignment and to provide TV marker frequencies. Highly stable Hartley oscillator has range of 150 kc. to 102 mc. with fundamentals to 34 mc. Colpitts audio oscillator supplies **pure 400 cycle sine wave** voltage for modulation. Vernier tuning condenser. Use audio oscillator voltage to test distortion in audio equipment, bridge measurements, etc.

FACTORY-WIRED AND TESTED
Model 320. Ready to use **$29.95**

VERSATILE MULTI-SIGNAL TRACER

$18.95

Model 145-K. High gain—high frequency. Self-contained test speaker permits audible signal tracing of RF, IF, FM, audio and video circuits. Provision for visual tracing with VTVM. Response is well over 200 mc. 3-color hammertone panel. 110-125 V. AC. Size: 10"x8"x4¾". Comes complete with tubes and diode probe in kit form.

FACTORY-WIRED AND TESTED
Model 145. Ready to operate..... **$28.95**

NEW PUSH-PULL 5" TV OSCILLOSCOPE Model 425-K Kit

$39.95

ALL-NEW laboratory precision scope has Push-Pull deflection and .05 to .1 volts per inch sensitivity. Wide range, flat from 5 cps to 500 kc. with full gain setting, useful to 2½ mc. Wide-range, multi-vibrator, sweep circuit from 15 cps to 75,000 cps. Direct connection to plates of CRT available at rear of cabinet. Z axis intensity modulation feature included. Size: 8½"x17"x13" high. Complete with 3—6SN7s, 2—6J5s, 2—5Y3s, and 5BP1 CRT.

FACTORY-BUILT OSCILLOSCOPE
Model 425. Fully wired and tested **$69.95**

HIGH PRECISION VACUUM TUBE VOLTMETER Model 221-K

$23.95

Tops in workbench versatility—15 different ranges! AC and DC ranges: 0/5/10/100/500/1000 volts. Electronic ohmmeter ranges from 2 ohms to 1000 meg. in 5 steps. New features include Zero Center for TV discriminator alignment. 26 Meg. DC input impedance. Accurate, 4½" meter cannot burn out. Double bridge balanced bridge circuit assures guaranteed performance. Sturdy portable steel base with etched rubproof panel. Will measure up to 30,000 V. and 200 MC. when used with our HVP-1 or P-75 probes. 110-130 V. AC 50-60 cycle. Size: 9 7/16"x6"x5".

FACTORY-WIRED AND TESTED
Model 221. Same, but completely wired, calibrated, and tested.... **$49.95**

DELUXE SIGNAL GENERATOR
MODEL 315

Completely wired, ready-to-use Signal Generator with 1% accuracy! A wonderful instrument with dozens of expensive features. Frequency range: 75 kc to 150 mc. Has microcycle band-spread vernier tuning for FM, AM, and TV. Voltage regulator. Write for full details. **$59.95**

Model HVP-1

HIGH VOLTAGE PROBE

Complete top-quality High Voltage Test Probe measures up to 30,000 volts. Special Helical-Wound Ceramic HV Multiplier Resistor adaptable to most VTVM's and 20,000 ohms per volt meters with 1000 or 5000 volt scales. Lucite head, plywood bakelite handle, large fleshguards for additional safety. Specify your instrument. Complete ready to use **$6.95**

HIGH FREQUENCY RF PROBE

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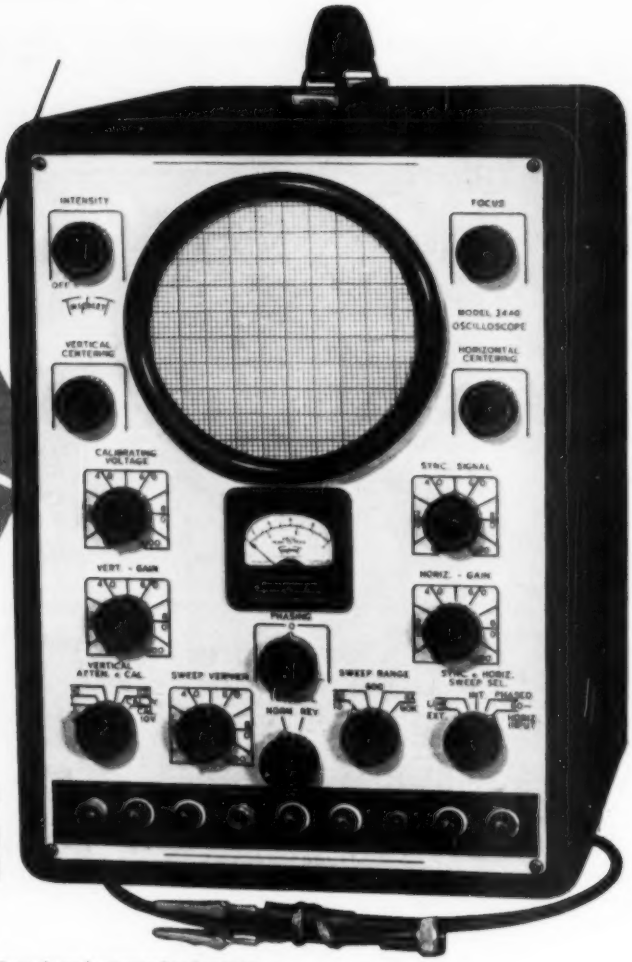

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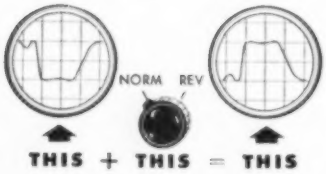

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Mobile TWO-WAY RADIO

By
DOMENIC R. RIPANI
Rockford Communications Co.

Radio on wheels offers service shops a new and profitable source of steady income. Get in on this latest boom.

Three mobile radio applications on which the service technician can cash in. Buses, taxis, and police departments are all good customers for both the installation and repair of mobile radio.

WHEN the FCC lifted the temporary freeze on commercial two-way radio activities last May, it changed many groups from an experimental to a permanent status. While commercial mobile radio operations had expanded considerably since the war, this relaxation of the rules and more liberal issuance of licenses, was like a "shot-in-the-arm" for these groups and spurred them on to further activity.

Prior to the war, two-way radio was considered principally as a necessary tool for the law-enforcement bodies throughout the country. Today we find industry turning more and more to this method of communication as an important addition to their operations. Transportation companies are finding that radio-dispatched vehicles result in more economical operations because the movement of the trucks can be controlled while in transit. Taxicab companies have found that radio-equipped cabs reduce the amount of dead mileage and also reduce customer waiting time. Utilities have discovered that radio-controlled trucks and service cars can be moved more quickly and efficiently during emergencies. An important user of radio, the *Greyhound Bus Line*, has found that not only do radio-controlled buses reduce operating expenses, but customer good-will and sense of security have increased. As Fire Chief Wayne Swanson of the Rockford Fire Department so ably puts it, "FM two-way radio, as used in the fire service, in my opinion, is one of the greatest appliances given to the fire fighter since the change-over from horses to automotive equipment". A. I. Koch, president of one of the first cab fleets to go 100 per-cent radio, the *Rockford Yellow Cab Company*, and former president of the American Taxi-Cab Association, expresses fully the general opinion of the cab industry by stating, "The addition of mobile radio equipment to cab operation has increased revenue by 50 per-cent, decreased operating costs, and has helped to build customer good-will to a high level."

These reasons will give some indication why industry is turning more and more to some type of radio-controlled operation.

Many more specific examples of mobile and portable operation could be cited, but it is sufficient to say that the field, expanding as rapidly as it is, has a great need for many more competent men. Many of the smaller radio-equipped companies "farm out" their radio service on a contract basis and it is to these organizations that the service shop should turn for additional revenue. On the other hand, many of the larger organizations hire their own full time radio technicians and it is with one of these groups that the interested individual should become associated. It is surprising to find that in many communities there are mobile units being maintained by technicians who must come from some other community to service mobile equipment. This, in communities where radio service shops already are established! The owner of a local radio shop, if of a truly progressive nature, will investigate the possibilities of adding this type of service, not only from a monetary point of view but from the standpoint of the greater service he can offer to his community.

Mobile radio equipment, in the ma-

An independent service shop, operated by Bill Wallingford of Rockford, handles mobile radio servicing for small municipalities as well as those for private firms.

jority of cases, uses FM today. In the early days of two-way radio, AM was the predominant method of communication, but with the possible exception of a few police AM systems operating around 1700 kc., most installations are now FM. Mobile equipment and the associated land station units are constructed along similar lines by the various manufacturers. The minimum requirements set forth by the FCC, coupled with the specific demands of industry, have resulted in a fairly uniform line of equipment both mechanically and electrically. Transmitters and receivers fall into two broad categories. They are: the low frequency units covering roughly a band of frequencies between 25 and 45 mc. and the high frequency units covering a band between 152 and 162 mc. This is not to be construed as the only available equipment, but only that the majority of operations fall into these two categories. Important users of the low bands include the sheriff networks, and the *Greyhound Bus Lines*. On the high band frequencies, 152-162 mc., will be found a great many types of services such as local police and fire departments, utilities, and the many cab companies.

The typical transmitter starts with a crystal-controlled oscillator, operating generally somewhere between 3 and 9 mc. Proper frequency multiplying in the following stages brings the frequency up to the correct operating band. Modulation is accomplished with a single button carbon microphone. Depending on the range desired and the economical limitations of the installation, transmitters are available with a power output of from ½ watt (the "walkie-talkie" variety) to the 50 watt heavy duty unit. However, the two popular types of transmitters in use today are the 7 watt transmitter using a single 2E26 in the final and the 30 watt mobile unit using either an 807 or push-pull 2E26's in the final. (Some types of 30 watt units use the quick-heating 5516 in the final.)

A local control base station which is manufactured commercially by Motorola Inc.

The primary source of power for these units is the car battery. Where a heavy drain of power is needed for proper operation of not only the radio equipment, but the various electrical accessories, many installations use the "a.c.-d.c." method of supplying power instead of the standard "battery-generator" system. In the a.c. system, the vehicle is equipped with a 3-phase alternator, the output of which is rectified by a dry-disc rectifier. The work of the car battery is reduced to that of supplying excitation to the alternator, and also for starting purposes. A further advantage of this system is that full output may be obtained even when the car engine is idling. The high voltage is generally developed by a vibrator in the case of a low power transmitter, while a dynamotor produces the necessary power for the larger type units. The antenna found to be most efficient and the type widely used is the quarter-wave, end-loaded type. A 52 ohm shielded line feeds the power from the transmitter to the antenna. This coaxial line connects to a coax relay at the transmitter, thus making it possible to switch the antenna from "transmit" to "receive" instantaneously.

The receivers are the crystal-controlled, fixed frequency types, possessing a high degree of selectivity. The selectivity is necessary if interference from adjacent channel operations is to be reduced to a minimum. While a few makes of receivers will be found using Magmotors to develop the proper "B" voltages, the majority will be found to contain vibrator supplies.

The actual work of installing mobile radio equipment in cars and trucks will present no problems that are not encountered in the installation of the ordinary car radio. The main difference lies in the fact that the units are installed in the trunk of the car and are connected by means of control cables to the control head mounted on the dashboard. The carbon microphone, containing a push-to-talk switch, is connected to this control head as is the loudspeaker. Depressing the microphone switch actuates the necessary relays in the transmitter for proper operation. The two important things to keep in mind when installing these units are to make certain that all grounding is mechanically and electrically tied securely to the car body and to be sure that all control cables are protected against possible breaks or shorts. Avoid sharp bends in cabling as they will always be the source of trouble.

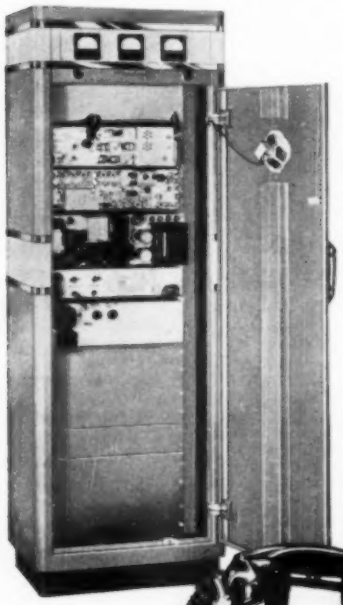
The basic circuits of the land base stations do not differ greatly from that of the mobile units. The differences lie primarily in the power supply systems used, a little difference in the relay control circuits, and possibly in the fact that a little more power output is obtained. The equipment of some manufacturers is such that there is hardly any difference in mobile units and land stations. One company produces a 30 watt station transmitter which is identical to its 30 watt mobile unit. This simplifies maintenance and reduces the amount of replacement items a radio shop must have on hand. This same manufacturer goes further and supplies a ¼ kw. final which may be driven to

full output with this same 30 watt exciter without any changes to the equipment.

Installation of base stations is not a difficult job. With the equipment is included detailed instructions and all necessary notations to enable the service technician to install the gear properly. As further protection, a quick call to the manufacturer's field representative in case of trouble will bring him immediately to help in the solution of any specific problems. The only really difficult phase of the installation is in the erection of the tower, if a tower supported antenna is included in the plans. Many technicians do not bother with this part of the job, but turn it over immediately to some firm equipped to do the work. However, in most cases, particularly small taxi-cab companies, the antenna desired will be a ground-plane or turnstile mounted on a small mast at some point near the transmitter site. Incidentally, an ideal and popular site for the antenna, if available, is a water tower. The first consideration in any installation is to determine where the point of operations is to be located—with due regard given to accessibility to power lines and antenna cable routing. If the selected site is in the vicinity of the operating room, then the transmitter-receiver console can be installed directly in this room. However, due to noise level conditions at the point of operation or if greater range is desired, in many cases the transmittter proper is located outside the city limits, the equipment being installed in a "dog house" or weatherproof cabinet at the selected site. A telephone line is then connected between these units and a small preamplifier installed at the point of operations. The preamplifier amplifies the incoming signals from the receiver and on "transmit" sends a small current down this line which actuates the necessary relays for transmitter operation. When the transmitter is to be controlled at two or more locations, then several of these remote preamplifiers are connected in parallel. In this case though, the FCC regulations require that *one* operating location be designated as the control point. This control point must not only be able to monitor all activities of the station, but must be able to make the transmitter inoperative at will.

Maintenance of two-way radio equipment is not as difficult as it might seem at first glance. In general, the units found in the field are well constructed and can withstand a considerable amount of abuse. Component parts work with a large margin of safety and seldom give trouble. In fact, it will be found that about 90 per-cent of the troubles are directly caused by defective tubes and vibrators. The technician, however, will be wise if he sets up a preventative maintenance program. This will reduce to a minimum the number of breakdowns on equipment and also keep the "out-of-service" time of the vehicles low. An extremely helpful tool, incorporated in practically all equipment nowadays, is the metering system. It is because of this systemized metering arrangement that the service technician can quickly locate a faulty stage. In fact, with this method, the trouble in a mobile unit can be located and repaired more rapidly than most home radios. As a specific example, one popular manufacturer provides a jack on his transmitters into which is inserted a 50 microampere meter. Located near this jack is a meter switch with a number of positions. Each switch position reads the grid current of the specific tube. A separate jack is provided for reading the plate current of the final amplifier. A quick check of all meter positions will show which stage is defective. The receiving equipment contains a similar arrangement permitting a rapid check of the over-all receiver performance. However, a fortunate condition exists in the maintenance of mobile gear in general. It will be found, after a little experience, that most troubles fall into very definite categories and may be located very quickly upon visual inspection.

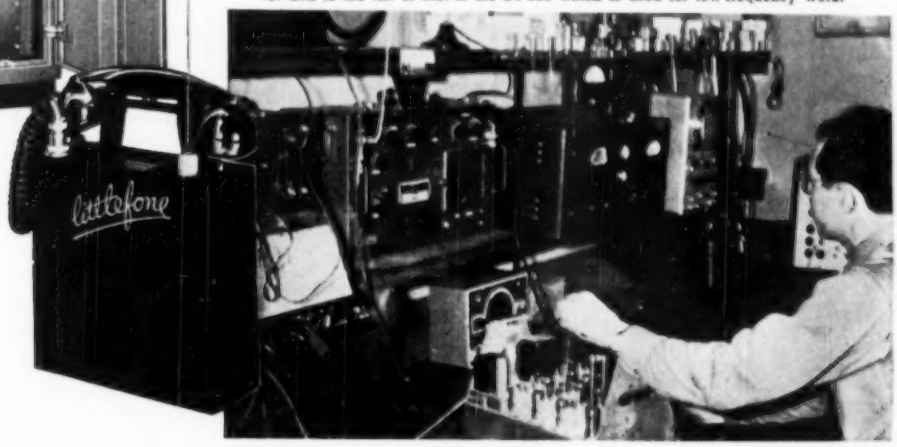
It was mentioned earlier that a preventative maintenance program was advisable. This program is necessary not only from the standpoint of reducing the number of breakdowns, but also to conform with certain specific regulations of the FCC. These rules call for a check, every six months, of the transmitter frequency of both the land station and

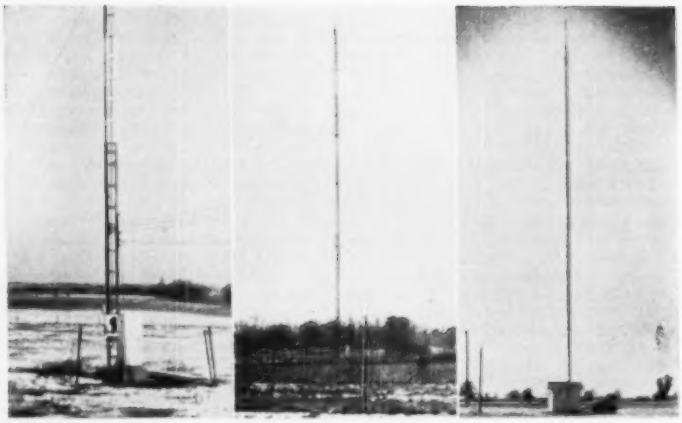


← A modern cabinet unit. Top section is a 30-watt transmitter with receiver immediately below it. The other three shelves contain the power and control equipment.

↓ A typical low-power unit of about ½ watt output which has proven popular in the construction field for use at the building site.

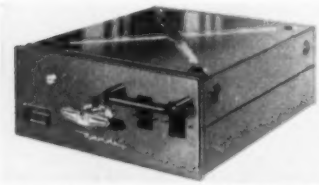
↓ The author's service shop. To the left of the oscilloscope is a Doolittle frequency monitor. To the left of the monitor is the I-122 high-frequency generator and to the left of that is the BC-221 which is used for low-frequency work.





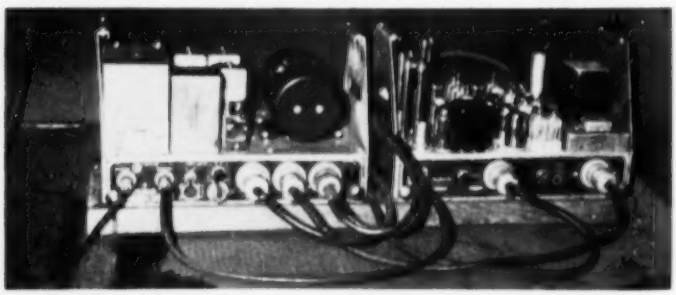
Remote transmitter installation (left) with equipment housed in a weatherproof cabinet. Tower lights are automatically turned on and off by means of a photoelectric cell located on left side of tower. (Center) Where extended range is an important consideration the antenna must be mounted as high as possible. In this case the tower is 150 feet high on top of which is mounted a ground plane antenna. Transmitter is connected to control point by telephone lines. (Right) Remote installation with equipment located in a small "dog house." Tower is 150 feet high on which is mounted a Motorola triple-skirt colinear coaxial antenna. This is an REA installation near Hayti, Mo.

the mobile units, the power input to the final stage (the product of the plate voltage and total plate current is acceptable) and the total modulation deviation (in the case of FM). To properly handle these requirements both legally and ethically, the service technician should periodically remove the units from the vehicles and check them completely on the work bench. In this way they can be checked for legal requirements and also be given a systematic cleaning, adjustment, etc. Obviously, certain pieces of test equipment will be required to maintain this gear. The test equipment found in the average shop can still be put to good use, such as the v.t.v.m., tube checker, and signal generator. In addition, however, there should be available a stable low frequency generator and a stable high frequency generator. For low frequency work, the BC-221 is good and for high frequencies, the I-122 is satisfactory. The FCC requires that a stable monitor be available to measure the transmitter frequency within the tolerable limits and also an accurate device for measuring the modulation. Perhaps the most stringent regulation set down by the FCC is that a license of the grade of 2nd class radiotelephone, or higher, is required by personnel making repairs or adjustments to a transmitter which might affect the frequency of operation. Under the law, however, a non-licensed man may make repairs and adjustments *under the direct supervision* of a duly licensed operator of the proper grade.



A combination receiver and 30-watt transmitter for mobile installations. Complete unit may be removed in one simple motion.

Interior view of taxi trunk. The 30-watt transmitter is at left and receiver is at right. Cabs operate in the 152-162 mc. band. Notice the switches mentioned in text.



The service technicians considering the possibility of entering this field should have no fear of the examination for FCC qualifications. On the market are several good manuals written specifically as a guide for this examination.

The radio technician who has had car radio experience, in addition to experience on home AM and FM receivers, will find that the knowledge acquired will provide most of the "know-how" needed to satisfactorily install and maintain mobile radio gear and their associated land stations. Most manufacturers of mobile radio equipment, anxious to have their equipment serviced properly in the field, authorize competent service shops in the various territories throughout the country to handle the work on their equipment. The radio shop owner would be wise in contacting the various companies to arrange for official recognition by one of these radio concerns. Advantages such as complete technical data on new gear, factory assistance when needed, and consideration on receiving the new installations as they are sold in the territory, become available when the shop becomes affiliated.

The ham will find that the experience he has gained through his association with home built ham gear, will provide him with most of the knowledge needed to handle this work, as the tuning and adjustment of these units is not unlike the average ham rig. Experience gained through operation of portable mobile equipment will also prove of great value in this line of work.

It is with groups such as the state or local police, or large utilities engaging full time radio help that the ham, possessing a commercial ticket, can take his place and handle the complete radio maintenance with little, if any, additional training.

Whether you contemplate seeking a position with some firm engaged in two-way radio work, or whether you operate your own independent service shop and are looking for additional steady business, you will find this work interesting and varied. You will experience the deep satisfaction that comes when the "big switch" is thrown and you've put a station and its private network on the air. So pause now and consider the many opportunities in this progressive field and begin making plans to take your place in its ranks.

A careful study of the field in general and the possibilities in your own locality will uncover numerous applications where two-way radio can perform a real service. With two-way radio's impressive record it is not too difficult to sell prospective users on such an installation—and when the equipment is in use it will follow quite naturally that the job of servicing and maintenance will be yours without question.

—30—

OSCILLOSCOPE for R.F.

By GUY DEXTER

Only basic scope is used. Test instrument is ideal for checking transmitters.

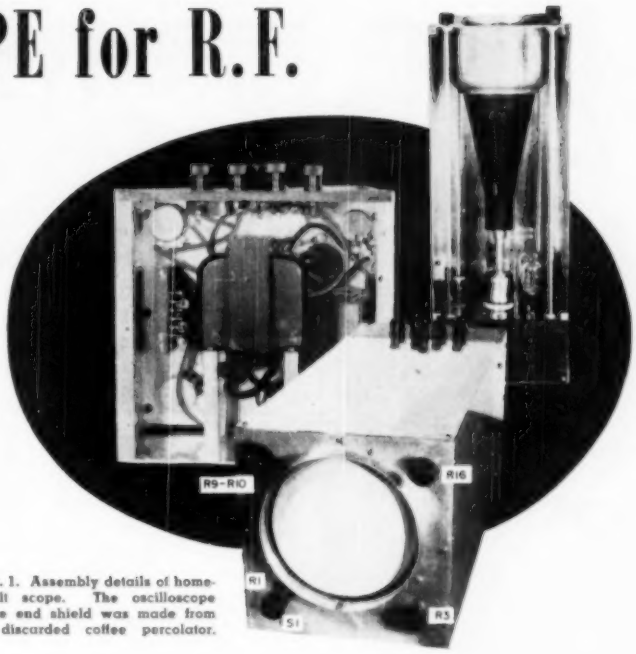


Fig. 1. Assembly details of home-built scope. The oscilloscope tube end shield was made from a discarded coffee percolator.

AN OSCILLOSCOPE for transmitter checking need not be expensive or complicated. A basic scope, minus amplifiers and sweep oscillator, is all that is required. An instrument of this type can be built easily with junk-box parts and one of the "cheapie" surplus 5-inch cathode-ray tubes. Using direct input to the deflecting plates, the basic scope is well suited to r.f. operation. Vertical and horizontal amplifiers and a sweep oscillator can be added externally if and when the scope is to be used later for other purposes.

The oscilloscope shown in the accompanying illustration is unique in that it is just a little larger than the 5BP1 tube itself. It is built in an aluminum case 19" long, 7¼" wide, and 7¼" high. A 3½-inch-deep compartment in the rear portion of the case holds and shields the circuit components. The controls are adjusted by means of long brass shafts which extend from the front-panel knobs to the potentiometers on the compartment partition. In order to conserve panel space, the beam centering controls (R_9 and R_{10}) are combined (*I.R.C. Concentrikit*) and operated from twin knobs and a concentric shaft.

The circuit is unusual in its use of a common replacement-type receiver power transformer. Any small transformer with a 350-0-350 v. secondary rated at 40 ma. or higher will do. The entire secondary winding is used in a voltage doubler circuit comprised of two 6X5GT tubes and two 0.15 µfd. tubular condensers (C_1 and C_2 in Fig. 2). The rectifier tube filaments are operated from the 5-volt winding of the transformer. A prolonged test run of the instrument revealed no trouble as a result of operating the tubes at this reduced voltage.

The deflecting plates are connected to binding posts *A, B, C,* and *D*. In addition, a signal voltage divider, connected to binding posts *E, F, G,* and *H*, is provided for audio voltage attenuation in modulation measurements.

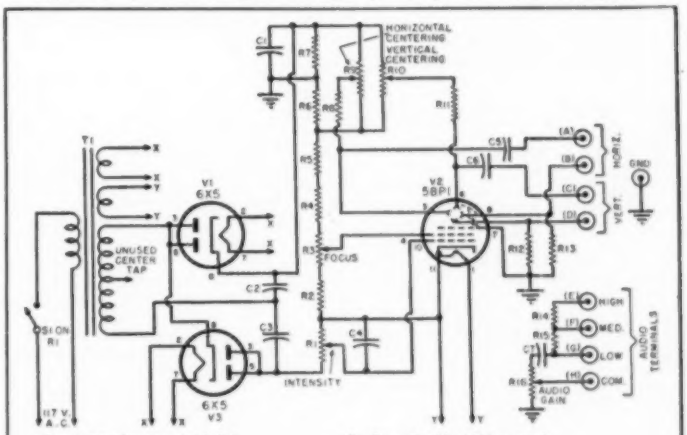
R.F. Applications

Use of the basic scope for modulation checking by means of trapezoidal patterns has been covered completely in previous articles and is described in detail in the amateur handbooks. Therefore, no space will be devoted here to an explanation of the method. To set the instrument up for modulation checking: (1) Connect an r.f. pickup loop to terminals *C* and *D*. (2) Connect *C* to "*GND*." (3) Connect audio output from modulator through suitable coupling condensers to *E, F,* or *G* (depending upon whether audio voltage is high, low, or medium). (4) Connect *H* to *B*. (5) Connect *A* to "*GND*."

One important use of the basic scope, almost completely overlooked by radio amateurs, is frequency multiplier

(*Continued on page* 106)

Fig. 2. Complete circuit diagram of oscilloscope. Only basic circuits are required.



R_1—1 megohm pot. (with S_1)
R_2, R_4—1 megohm, 1 w. res.
R_3—2 megohm pot.
R_5, R_{13}—5 megohm, 1 w. res.
R_6, R_7, R_8—2 megohm, 1 w. res.
R_9, R_{11}, R_{12}, R_{15}—2 megohm, ½ w. res.
R_{10}, R_{16}—2 megohm concentric control pot.
R_{14}—1 megohm pot.
C_1, C_4—.25 µfd., 200 v. cond.
C_2, C_3—.15 µfd., 1000 v. cond.
C_5, C_6—.05 µfd., 1000 v. cond.
C—.01 µfd., 2500 v. mica cond.
S_1—S.p.s.t. sw. (on pot. R_1)
T_1—Replacement-type rec. trans. 350-0-350 v. @ 40 ma. (or higher); 6.3 v. @ 2 amps; 5 v. @ 2 amps
V_1, V_3—6X5GT tube
V_2—5BP1 tube

Model N Geiger unit made by Western Radiation Lab.

Beckman Model MX9 produced by Nat. Tech. Labs.

The Model 106 Geiger counter built by Precision Radiation.

Nuclear Instrument Corp.'s radioactivity "Sniffer" model.

Technical Associates' custom-built No. F3-B.

THE ERA OF GEIGER COUNTERS

A review of commercially-built instruments for the detection of radioactive materials.

By

LESLIE M. NORMAN

Pres., Precision Radiation Instruments, Inc.

A NEW vocabulary has found its place in our everyday conversation. Words like Geiger counter, atoms, nuclear physics, uranium, plutonium, chain reaction, radioactivity, cyclotron, beta and gamma rays have become commonplace since Hiroshima.

Uranium was first discovered in 1789 by M. H. Klaproth and named for the planet Uranus. Most of its properties have been well known for half a century. It was not, however, until 1939 that experiments in Western Europe definitely proved that uranium could provide a chain reaction, releasing a hitherto undreamed of and fantastic amount of power. This discovery started a scientific race unparalleled in the history of mankind and culminated in the atomic bomb.

It is rumored that a single gram of the priceless U-235 used in the atomic bomb requires the mining and processing of no less than one million pounds of uranium bearing ore. A gram is not enough material to fill an ordinary sewing thimble.

The need for uranium is so enormous that the Atomic Energy Commission has offered a cash bonus of $10,000 for each new discovery of suitable content plus a ten year guarantee price of $3.50 for each pound of uranium oxide recovered. Furthermore, one or more other valuable minerals such as radium, silver, vanadium, lead, and thorium always accompany a uranium deposit. These facts have started a stampede of an army of prospectors armed with Geiger counters on the search for uranium. The stampede overshadows even the Gold Rush of '49.

The richness of the reward explains the strange texture of this army. People from all walks of life have joined the search. They include professors, vacationers, physicists, campers, geologists, Boy Scouts, prospectors, retired businessmen, salesmen, doctors, engineers, cooks, and what have you. The search extends not only to every state in the union but to every corner of the world. The extent of the movement can best be understood when it is known that sales of Geiger counters have already soared into the tens of thousands in the United States alone.

One of the principal characteristics of uranium is its property of radioactivity. The radiations emitted cannot be seen, heard, or felt and can only be detected by means of a special instrument such as a Geiger counter. There are other means of detection besides Geiger counters but all are either unreliable or impractical for the prospector.

One such method is the photographic test. This makes use of the fact that radioactivity will blacken an unexposed photographic film in the same manner as sunlight. In order to employ this test it is necessary to exclude all light and leave the ore sample on the film for a period of days or weeks depending on the quality of the ore. The limitations of this method are evident.

Another method is the ultraviolet light or "mineralite" which makes use of the principle that fluorescent minerals will glow when exposed to ultraviolet light. The use of fluorescence is extremely limited since only one or two important uranium minerals, chiefly autunite, are always fluorescent. Pitchblende, carnotite, and uraninite, the three most important uranium minerals never fluoresce. Many minerals which contain no uranium do fluoresce. Furthermore a mineralite should be used in darkness for best results. Thus the mineralite has little value in the search for uranium.

The scintillation test can be used because a screen coated with zinc sulphide powder, when struck by a radioactive ray, will produce bright flashes of light known as "scintillations." The scintilloscope can only be used in a dark place and will only detect surface radioactivity. The instrument does not indicate radium that is below the surface of the sample and is very fragile. This rules out its use by serious prospectors.

The electroscope makes use of the fact that two very thin metal strips, usually gold, when electrically charged will separate and stand erect. Radioactive rays will discharge the instrument, causing the strips to fall. This instrument is extremely fragile and has no practical use outside of the laboratory.

The most accurate method is chemi-

cal analysis which is, of course, limited to the laboratory.

The Geiger counter is a rugged, reliable instrument. It works under all conditions and is extremely sensitive. It will detect even very minute amounts of radium. It is small, lightweight, and portable. Thus it is the only practical field instrument. Furthermore no laboratory is complete without one.

This is significant to the enterprising radio technician since a Geiger counter is an electronic device which can best be sold and serviced by a radio dealer. It is similar, in a general way, to a small battery-operated portable radio. The circuits employed in these instruments can be easily understood by any radioman. The heart of the Geiger counter is the Geiger Mueller tube. The principle employed in this tube is relatively simple. It contains an anode and a cathode separated by a gas which may be ionized. A high voltage is applied between the anode and cathode of a value just below that necessary to ionize the gas in the tube. The voltage used is generally around nine hundred volts but is sometimes as low as two hundred volts. When even a single radioactive ray strikes the tube it causes the gas to ionize momentarily, causing a very minute amount of current to flow. The current passes through a resistor of high value causing a momentary voltage drop.

This pulse is usually amplified and then indicated by one or more of several methods. The amplifier circuits will not be discussed here because they follow the same principles employed in radio circuits which are well known to radiomen. The simplest types of Geiger counters use an earphone as the only means of indication. The user counts the number of clicks per minute he hears in the phone. More elaborate instruments have earphones and a neon bulb which flashes with each impulse. The best types have, in addition to the phones and flasher, an indicating meter with three ranges and detect beta as well as gamma rays. Geiger counters with a thick wall Geiger tube detect gamma rays only.

One of the primary considerations in building a Geiger counter is the high voltage supply used to operate the Geiger tube. This problem has been solved in many different ways by various manufacturers. Each method has its own advantages and disadvantages.

The simplest method is that used in the Model N made by *Western Radiation Laboratories*, 1107 W. 24th Street, Los Angeles 7, California. In this instrument (Fig. 4) a small one hundred and eighty volt Geiger tube is used with six 30 volt hearing aid batteries in series. Since no amplifier is employed the unit has a long battery life and is compact. This instrument employs earphones only and weighs about one pound. It does not detect betas.

In the model F3-B (Fig. 3) made by *Technical Associates*, 3730 San Fernando Road, Glendale 4, California, a nine hundred volt Geiger tube is used with three 300 volt batteries in series. This provides stable operation and long battery life. The F3-B has earphones and a three range indicating meter and weighs ten and a half pounds. It detects both betas and gammas.

The *Beckman* Model MX8 (Fig. 2) made by *National Technical Laboratories*, South Pasadena, California, employs a unique method. A nine hundred volt Geiger tube is used with a single three hundred volt battery. The battery is placed alternately in parallel and in series with two condensers by flipping a spring action switch. This charges the condensers to 300 volts each and then places them in series with the battery to provide 900 volts. The advantages are simplicity, long battery life, and light weight. The MX8 has earphones as the only means of indication and weighs three and a quarter pounds. It detects both betas and gammas.

The "Sniffer" made by *Nuclear Instrument and Chemical Corporation*, 223 W. Erie Street, Chicago 10, Illinois, employs a mechanical vibrator power supply for the high voltage. Two 1½ volt batteries in series supply the three volts needed to operate the vibrator which changes the d.c. voltage into a.c. The a.c. voltage is then applied to a transformer which develops the high voltage. This voltage is then rectified by a rectifier tube and filtered to provide the high d.c. voltage. Five neon bulbs in series are used to regulate the voltage which is then applied to the Geiger tube. The advantage of this method is the light weight and low battery cost. The mechanical vibrator requires power to operate it and, therefore, the batteries are rated by the manufacturer at forty hours life. This instrument weighs only two pounds.

The Model 106 made by *Precision Radiation Instruments, Inc.*, 5478 Wilshire Blvd., Los Angeles 36, California, (Fig. 1) employs an r.f. power supply. In this method two small 45 volt batteries are placed in series to provide 90 volts which is applied through an *RC* circuit to a neon bulb. This sets the neon bulb into oscillation providing a source of a.c. The a.c. is then amplified by a miniature tube and applied to a high impedance choke coil. A high voltage is then obtained across the choke coil and is rectified and filtered. An electronic voltage regulator circuit is used to keep the voltage con-

(*Continued on page* 137)

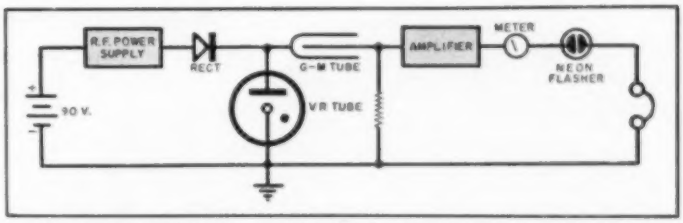


Fig. 1. Simplified block diagram of Precision Radiation Instruments' Model 106 unit.

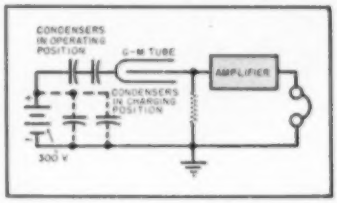


Fig. 2. Block diagram of Model MX8.

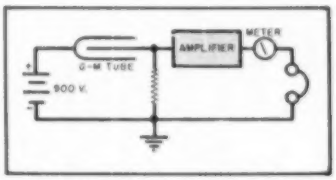


Fig. 3. Simplified circuit of Model F3-B.

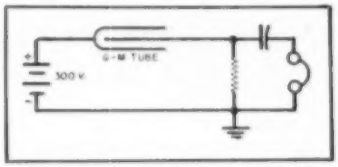
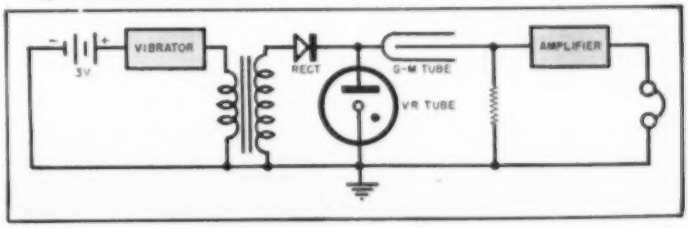


Fig. 4. The basic circuit of Model N.

Fig. 5. Simplified block diagram of Nuclear Instrument Corporation's "Sniffer" model.



Details of a preamp incorporating a variable equalizer to compensate for variations in phono pickups and recordings.

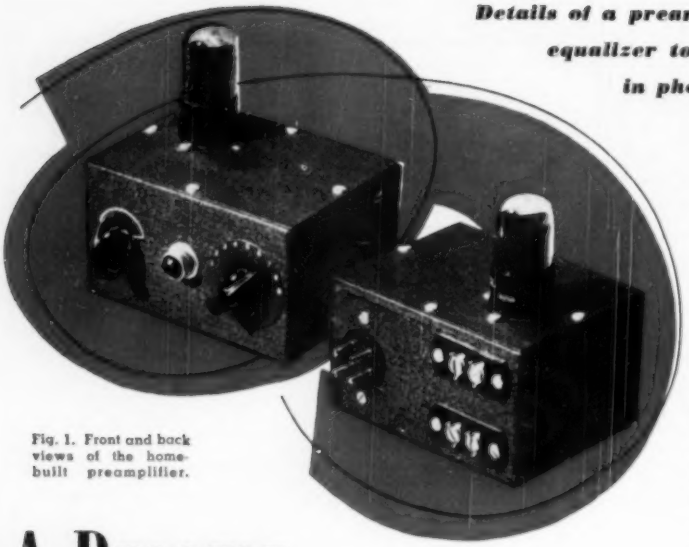


Fig. 1. Front and back views of the home-built preamplifier.

By
CHARLES BOEGLI
Cincinnati Research Company

A Preamp for MAGNETIC and CRYSTAL PICKUPS

ALTHOUGH in fairly common use with microphones, so-called "preamplifiers" were relatively unknown in connection with phonograph pickups until the marketing of the *Caltron*, *General Electric*, and a few other popularly-priced magnetic cartridges of very low output made them necessary. The "phono" input of most amplifiers prior to this time required about 0.5 volt to drive the power stages fully, and these new cartridges produced a signal at best only a fiftieth that great.

Various more recent magnetic cartridges furnish substantially higher outputs and can often be connected directly to the low-gain input of the amplifier but the introduction of equalization, so necessary to compensate for the multitude of recording characteristics in existence, invariably reduces the pickup output again to too low a value for most older amplifiers. There are three solutions to this problem; first, the equalized pickup signal can be fed into the "microphone," *i.e.*, high gain, channel of the amplifier; second, a special "magnetic phono" input can be provided with subsequent equalization, as in many modern amplifiers; and third, a combined preamplifier-equalizer separate from the main amplifier can amplify the signal to the proper value for the low-gain input.

The first arrangement has many disadvantages. Equalizer design is not only apt to be dependent upon the cartridges in question, but particularly in the case of low-output cartridges the level of the equalized signal will be so low that hum pickup in the connecting cables and tube noise in the first amplifier stage will reach an objectionable level. It is always desirable to keep weak signals at their maximum possible levels in order to increase their magnitude in relation to hum pickup and tube noise, and this requirement indicates that the equalizer should be located at some later point in the amplifier where its attenuation will be of little consequence. The second alternative mentioned accomplishes this objective satisfactorily, but it, too, suffers from several shortcomings. The amplifier is often located at some distance from the pickup and it is then usually impossible to arrange a convenient means for inserting various equalizers. Most amplifiers equipped with a magnetic cartridge input therefore have only a single equalizer, and from what will be said later about recording characteristics it will become manifest that such an arrangement is absolutely insufficient.

The last alternative, the separate equalizer-preamplifier, has none of these drawbacks. Means are easily provided right at the turntable for switching various equalizers into the circuit. At the same time these equalizers can be located at a point where signal strength is many times the tube noise level. The full cartridge output is fed through a short cable into the first grid, and the preamplifier output is sufficiently great that hum pickup even in fairly long high-impedance lines is easily eliminated. The sole disadvantage of the preamplifier is the necessity either for a separate power supply or for obtaining supply voltages from the main amplifier via a cable. The latter is generally the better arrangement by virtue of the superior filtering economically available, but this power-supply cable is seldom a cause of much inconvenience. The separate preamplifier is the only satisfactory means of utilizing older amplifiers with the new magnetic pickups.

The equalizer-preamplifier to be described was originally intended for use with a high-output magnetic pickup; it has a gain of 30 at 1000 c.p.s. and therefore supplies a signal of 3 volts with an input of 100 millivolts. Even with a 10-millivolt input the output will be sufficient for most amplifiers. It was also first desired to provide a separate equalizer specifically tailored to each make of commercial pressing now on the market, the proper equalizer to be selected by means of a switch. Further study has shown the impossibility of attaining the latter ambition and the crying necessity for some sort of standardization in commercial recording characteristics. It has nevertheless been found possible with eight or nine equalizers to compensate very well for most modern pressings and satisfactorily for a great many older recordings. The final unit is believed to have advantages in convenience and fidelity over most other amplifiers now available, and its circuit and construction are consequently described in detail.

Although originally intended for use with magnetic pickups, the preamplifier to be described can also be em-

ployed to great advantage with crystal cartridges. For this purpose the crystal unit it made velocity-responsive by loading it with a very low resistance, which simultaneously reduces the output voltage to the proper magnitude and effects a remarkable improvement in the quality of reproduction, as will be described later.

The preamplifier itself consists simply of two conventional high-mu triodes in cascade. The 6SL7GT is admirably suited to the purpose and is used here. As with all high-mu triodes, certain precautions must be taken to prevent high-frequency attenuation from the Miller-effect capacitance. Particularly in the case of the 6SL7GT, when operating at a gain of 30, the input capacitance is in the order of 100 $\mu\mu$fd., which means that a resistive source impedance no greater than 75,000 ohms can be tolerated if response is to be down 3 db. at 20 kc. This offers little difficulty in the first stage because both magnetic and crystal cartridges will be loaded with lower resistances than this, but the input to the second stage is more critical. In this preamplifier the equalizers are located between the first and second stages and the input resistance to the second stage can thus be reduced to the required level. This location of the equalizers has the further beneficial effect of reducing the signal input to the second stage to the point where it is easily handled without noticeable distortion.

The equalizers described later all have an amplification of about 0.022 at 1000 c.p.s.; even at 20 c.p.s. the amplification is generally only 0.32 so that at this low frequency, a -2 volt bias on the second stage will easily permit a signal input of 0.1 volt to the first stage. This is considered adequate for the entire range of available magnetic pickups and is also suitable for crystal pickups if they are properly loaded. The minimum input voltage is of course determined by the required output signal but a 0.01-volt signal provides a 0.3-volt output at 1000 c.p.s., which is sufficient for most amplifiers.

The completed preamplifier is shown in Fig. 1 and Fig. 3 gives the circuit diagram. The cathodes are heavily bypassed to prevent loss in gain and to reduce hum introduced by the heaters. This, coupled with the low grid-current impedances, reduces noise to a very low value. The main requirement is for a well-filtered "B+" supply, which must be adequately decoupled from the remainder of the amplifier to prevent motorboating. The plate current requirement is about 5 ma. so if desired this decoupling can be carried out with a high-inductance audio coupling choke and a high-value electrolytic condenser. The circuit components were chosen for a 320-volt "B+" supply after decoupling; for a 250-volt supply the same values can be used but the permissible input is somewhat reduced.

The entire unit is compactly housed

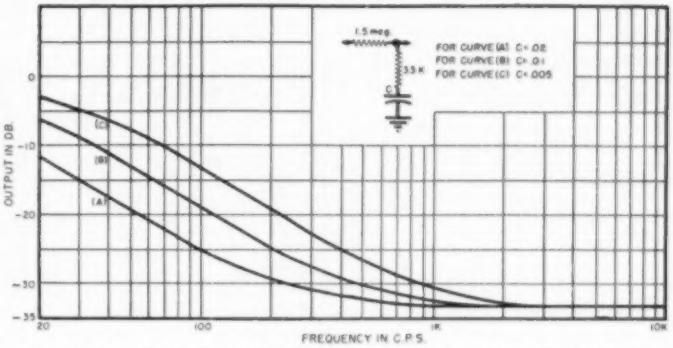


Fig. 2. (A) Equalizer for flat recordings with 250 c.p.s. turnover. (B) Equalizer for flat recordings with 500 c.p.s. turnover. (C) Unit for flat recordings with 1000 c.p.s. turnover.

in a small steel utility cabinet with the "on-off" switch, pilot light, and equalizer switch brought out on the front. Ordinary screw-terminal strips are provided on the back for the input and output connections because the preamplifier is intended to be located in the same cabinet with the pickup and turntable. Following the accepted practice, power connections are made to a 4-prong male plug on the chassis. It is important to float the tube socket on rubber to reduce microphonics; even with this precaution some makes of tubes will be found much freer from microphonics than others.

Magnetic cartridges are connected directly to the grid of the first tube, which is loaded with the resistance R, of proper size for the pickup in question. This resistance is usually specified by the maker of the cartridge with a view toward reduction of needle scratch and high-frequency drop. Crystal cartridges should be loaded with sufficiently low resistance to bring the 1000-c.p.s. response to no more than 0.1 volt; for a 0.001-μfd. cartridge with an open-circuit output of 1.0 volt R is about 16,000 ohms. This resistance is usually low enough to insure constant-velocity response

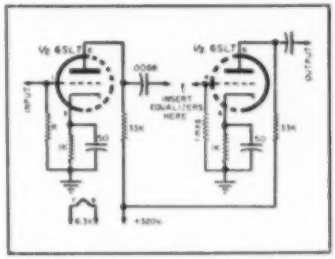
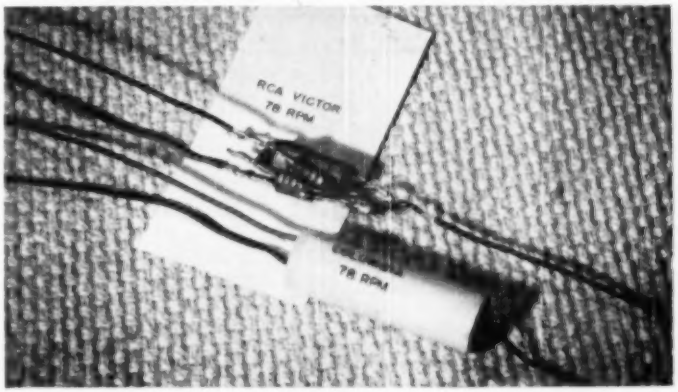


Fig. 3. Circuit diagram of preamplifier.

over the entire audible range. With some pickups this resistance can be chosen so as to eliminate, to a large degree, the high-frequency peak arising from needle resonance; the load resistance then equals the impedance of the cartridge at the point where treble response is up 3 db. from needle resonance. This low load resistance improves the damping of the input circuit and results in markedly reduced needle scratch and cleanness of reproduction. It should be remembered, however, that most crystal pickups have a response that is far from smooth and in general they cannot be

Fig. 4. Equalizers used in preamplifier for RCA Victor and Columbia 78 r.p.m. records.



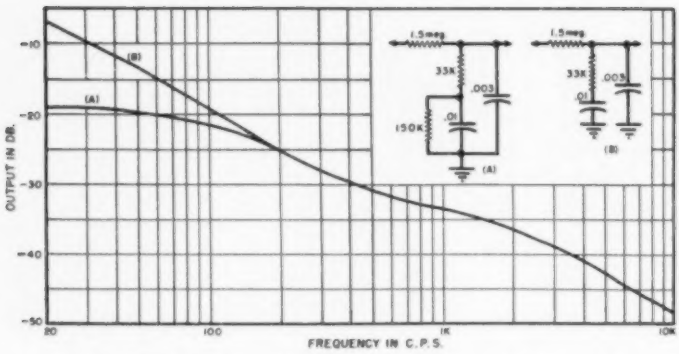


Fig. 5. (A) Equalizer for Columbia Microgroove recordings and its frequency response curve. (B) Equalizer and response curve for the NAB Standard recordings.

expected to yield as good results as the magnetic units.

Equalizer Design

The equalizers are the heart of the preamplifier. Really satisfactory reproduction of records is possible only when the recording characteristics are perfectly compensated by means of properly-designed equalizers. It is true that the ear can accomodate itself, in a way, to imperfect frequency response, but although a system with poor response may sound all right by itself, it will pale considerably when compared directly to a much more perfect amplifier. For this reason there is simply no use in providing a single equalizer for the diversity of recording characteristics now in use. Even versatile bass and treble tone controls cannot be relied upon to supply the additional correction necessary with some discs, and even if they could, this would constitute a misuse of those controls, which are more properly intended to compensate for room acoustics and playback level.

A variable equalizer allowing control over turnover frequency and degree of bass emphasis is still insufficient. Many modern records have considerable treble pre-emphasis which remains uncorrected by such an arrangement. Some recent discs also have additional bass emphasis which again is overlooked by any such simple circuit. Even if a versatile equalizing system were available by which any part of the audio-frequency spectrum could be accentuated or attenuated to any degree, it would not be enough unless the recording characteristics of each pressing were known and the proper settings of the equalizer controls had been calculated. As has been mentioned, unless the original sound source or a high-fidelity reproduction are present for comparison, the ear would not be able to tell in what way the response was defective; even sensitive persons can at times only declare a reproduction to be unsatisfactory without being able to state what is wrong with it.

The only solution seems to be a separate equalizer tailored to each commercial recording characteristic, but the diversity of such characteristics makes this ideal all but unattainable. Nevertheless the great preponderance of pressings can be perfectly compensated by means of only a few equalizers, and when sufficient circuits for this purpose are provided, the remaining records generally sound pretty good with at least one of the available equalizers. For use with the preamplifier described, therefore, sufficient equalizers to correct the major modern pressings and the predominant older ones have been designed and are described in what follows. These equalizers are inserted in the preamplifier at the point indicated in Fig. 3. Electrically the only requirement is that the input impedance be high enough to avoid loading the first tube excessively, and the output impedance be sufficiently low to avoid high-frequency drop from the Miller-effect capacitance of the second tube. In addition to this, the attenuation of all the equalizers should be the same at, say, 1000 c.p.s. to avoid the necessity of adjusting the amplifier gain substantially when the equalizers are changed.

Flat, 250 c.p.s. turnover. The equalizer to correct for-records with a turnover at 250 c.p.s. and a flat treble characteristic is shown in Fig. 2A, together with its response curve. This equalizer is used with *British H.M.V.* and a number of other European pressings.[1] It should also be tried with any American pressings that have been recorded in Europe.

Flat, 500 c.p.s. turnover. Fig. 2B shows the equalizer for a simple 500 c.p.s turnover characteristic. This circuit is employed for a good many American pressings of older vintage.

Flat, 1000 c.p.s. turnover. For a 1000 c.p.s. turnover the equalizer given in Fig. 2C is very good, but there is slightly greater bass drop than with the two previous circuits. This equalizer will rarely be used but the characteristic is followed on some European recordings.

If the minimum number of equalizers is desired, those for 250 c.p.s. and 1000 c.p.s. turnover can be omitted. There is only a slight audible difference between the three when playing a given disc.

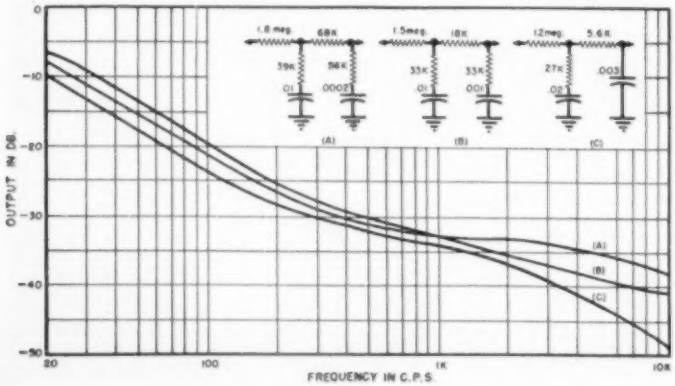
NAB characteristic. The NAB curve is followed in *Artist, Capitol, M.G.M.*, and many other American pressings. It is characterized by a low frequency turnover at 500 c.p.s. and a treble pre-emphasis of 6 db. per octave commencing at 1590 c.p.s. The equalizer of Fig. 2B is easily modified for this purpose by shunting the output with a condenser as shown in Fig. 5B. Although this simple addition results in a slight deviation from the ideal in the vicinity of 1590 c.p.s. the variation has been found by measurement to be exceedingly small and this simple circuit gives excellent results.

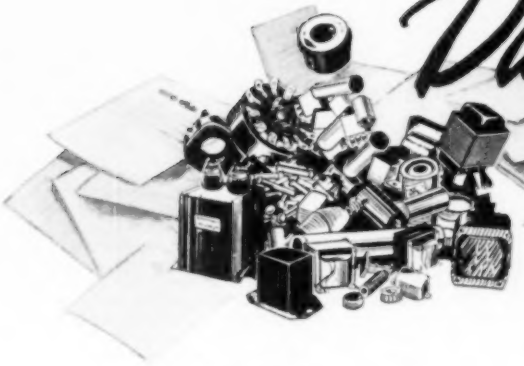
Columbia Microgroove characteristic. The recording curve for *Columbia* Microgroove records differs from the NAB curve in that extra bass emphasis is provided, amounting to 3 db. at 100 c.p.s.[2] This is corrected simply by adding another resistor to the NAB equalizer as indicated in Fig. 5A.

Columbia 78 r.p.m. characteristic.

(Continued on page 120)

Fig. 6. (A) Equalizer and its response for Decca FFRR records. (B) Frequency response and equalizer for Victor 78 r.p.m. records. (C) Equalizer and response for Columbia 78 r.p.m. records.





Discount THOSE MATERIAL BILLS

By HAROLD J. ASHE

Judicious borrowing or advanced planning enables shop owners to save real money on stock purchases.

IF THE radio and television service shop owner were obliged to pay his banker from 18% to 60% interest a year on a loan, he would be warranted in complaining bitterly about usurious rates. Such rates of interest would lay such a heavy burden upon the shop that, very likely, its owner would be forced out of business.

Yet, paradoxically, many shop owners pay the equivalent of such interest rates year after year without a murmur of protest. They do this in a left-handed manner, due to their failure to take all cash and quantity discounts made available to them by their suppliers. Any available funds that a shop owner has can earn for him vastly greater returns in taking such discounts than these funds can earn in outside investments. Nevertheless, many service shop owners persist in channeling savings into savings accounts paying 2% interest a year, and other low-return investments, while bypassing the high-earning possibilities offered them in their own business.

Terms of 1 per-cent in 10 days or net in 30 days may sound trivial to the reader who, at the same time, considers a 6 per-cent bank loan a burden to carry. However, letting the discount period pass on a bill offering such returns will result in paying 18 per-cent annually to the supplier for the use of the latter's money, assuming the bill is paid at the end of the 30-day period. And it had better be, if the shop owner doesn't want to wreck his credit standing with all supply houses. That is, he is paying (because he is losing) 1 per-cent of the bill for a 20-day extension of time, or at the rate of better than 18% a year. This is about the most expensive type of loan that can be negotiated. And it is a loan, even though it is not put on that legalistic basis

Cash discounts, alone, can go far toward constituting a large share of the *net* profits of a service shop—depending only upon the amount and kind of discount opportunities offered by supply houses. These vary in different sections of the country.

In weighing the importance of cash discounts as a possible source of additional shop net revenue, consider the annual earning rates of various discount terms shown in Table 1.

These earning rates of discounts are based on the elapsed time from the end of the discount date to the end of the net date after which the bill becomes delinquent.

If the shop owner is unable to discount all bills at the outset, he should nevertheless constantly refer to the given earnings table and apply whatever funds are available to taking the cash discount on those bills earning the most. Example: A bill offering a cash discount of 2% in 10 days or net 30 days (36% a year earnings) should have precedence over another offering 1% in 10 days or net 30 days (18% a year earnings). If these discount earnings are allowed to accumulate, the shop owner should eventually acquire enough funds with which to discount all bills.

Bills should be filed for payment according to the dates when discounts expire so that those bills about to become net will show up first for payment before discounts are lost. In small shops an ordinary clip board, obtainable at any stationer, will suffice. Bills should be clipped to the board in the order of their discount due date, those approaching payment date being on top. A quick tally periodically will reveal the amount of cash that must be available to meet bills and when. Sometimes, by being forewarned, the shop owner can so maneuver as to make more funds available for discounting than would be the case if he does not plan in advance for these dates.

Table 1. Annual earning rates of the various discount terms offered shop owners.

½% in 10 days, net 30 days	9% a year
1% in 10 days, net 30 days	18% a year
1½% in 10 days, net 30 days	27% a year
2% in 10 days, net 30 days	36% a year
2% in 10 days, net 60 days	14% a year
2% in 30 days, net 60 days	24% a year
2% in 30 days, net 90 days	12% a year
2% in 30 days, net 120 days	8% a year
3% in 10 days, net 60 days	21% a year
3% in 10 days, net 90 days	13½% a year
3% in 30 days, net 60 days	36% a year
3% in 30 days, net 90 days	18% a year

Sometimes, the shop owner may be able to persuade his banker to advance a small loan for the express purpose of discounting bills. This loan objective makes good sense to bankers. This may put the shop owner on a full discount basis sooner and, at normal bank interest rates, he should make a profit on the transaction. However, the loan should be scaled to an amount that can be used every month, so that the revolving fund can work every month of the year. The loan should be for an amount equal to the minimum monthly material purchases having discounts—not on the basis of a peak month of the year. Otherwise, if a maximum loan is obtained, the borrower will be paying interest on part of the loan which may have discount opportunities only one or two months of the year. Example: Experience shows the minimum monthly purchases having discounts available are $500, the maximum is $1200. The loan should be for no more than $500, even less if the borrower can supply part of the funds himself. The borrower should resolutely refuse to di-

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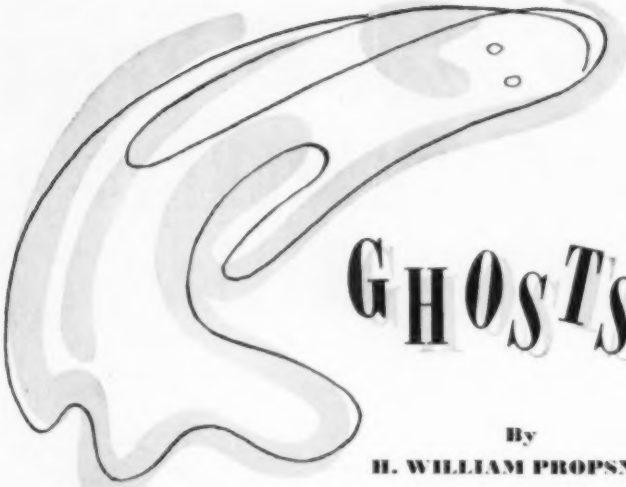


GHOSTS

By

H. WILLIAM PROPSNER

How to subdue annoying video ghosts with a minimum of special antennas and hardware.

NOTHING plagues the television technician more or sours a sale for a dealer faster than reflections which a customer won't tolerate.

Mathematicians and engineers have spent considerable time calculating the source of the reflections on the television screen. Radar theory has them bouncing every which way as water does from a fire hose played on a car.

Even the layman knows that "ghosts are a phenomenon created by successive signals arriving later than the original video frequency and manifesting themselves directly in superimposed pictures or reflections on the television screen."

Unfortunately there is no single solution to the problem of reflected pictures. Every situation is different. Similar problems occur in the same area, but the solutions will vary. The old process of cut and try and experiment will inevitably produce results. An article such as this can only become a guide and provide background data for further experimentation. It is understood that the basic principles of antennas and their use are common knowledge. Certainly there is sufficient literature available. Much of this article may be a recapitulation of information already known. However, since it is based on day in and day out experience in all kinds of weather, it can save time and money.

The only definite statement anyone can make concerning the proper installation of a television antenna where ghosts abound is that it requires honest work. What works perfectly for one installation can be disappointing or impossible for another.

The author is selling nothing but the idea that ghosts can be reduced or made less objectionable by the TV set owner himself. Inexpensively.

Generally where there is a ghost, the transmitter is close and the gain is high at the receiver. However, ghosts can occur anywhere, although they are much less of a problem outside a 20-mile radius of the station. Out where the signal is clean or perhaps flecked with a little snow, antenna work follows electrical and mechanical practice. Just put up the necessary skyhook so it won't fall down, orient it by the sun or neighboring antennas, and run a wire to the set. An airplane may cause a fluttering ghost now and then, but its reflecting surface is happily transient.

There are *wide* reflections, so wide that the left-hand edge of the raster makes a disconcerting vertical bar or two near the middle of the picture. There are ghosts which put extra teams on the field during ball games which are more distinct than the home team. There are ghosts that just make the picture fuzzy. Some affect the best sync circuits so that the picture rolls vertically at every spark or noise. Some ghosts can be tolerated and show up badly only on advertisements or where straight lines are shown. Others may pass as minor on a test pattern when the antenna is installed, but cause cross-eyed actors and maddening outlines on programs.

High-gain, narrow-bandpass receivers tend to accentuate the reflection problem, even picking up ghosts from passing cars. No one receiver is necessarily better than another in a ghost-haunted regions. With careful antenna work your set will work as well as the next. The antenna is more important than the set.

Initially, a transmission line to match the set, usually 300-ohm line, *is* preferred. Brown or black polyethylene cracks and deteriorates less in sunlight than the lighter colors. Where a strong signal is known to be present, good shielded line is all right, provided thought is given to the possibility of moisture entering the tubing. If it can be done at all, a well-routed unshielded line and an antenna, particularly a stacked array, located and oriented to minimize interference are better than the results achieved by installing coax or Twin-X.

The simplest of electrical tools and television antenna materials are all that are necessary to clean up most pictures. A complicated antenna for high power gain, installed at much expense and effort as high as practicable, does better as a balloon trap than as a device to cut down reflections.

An adjustable V-type or bug antenna is an ideal type in ghost-elimination work since it can be oriented in every possible position by hand with angles between 0° and 180°. The dipole lengths can be adjusted as shown in the diagrams, and it can be very easily moved about by hand, or on a pole if necessary. Unbalanced arrangements of angles and dipole lengths and odd orientations can be tried right at the set, providing there is sufficient signal strength. Of course, few people want an antenna stuck in some odd place in the same room with the set, but an idea of the best arrangement for a dipole can sometimes be secured before work is done elsewhere. Unfortunately, it is only an idea, for ghosts are nasty and don't play fair.

In an apartment building an indoor antenna may be necessary, and here the reflections may be of the worst possible type. For many such installations a booster is necessary or a genuine aid.

Begin with the V-antenna and a piece of lead-in connected to the set, nothing else. Perhaps a vertical orientation with an angle of 120° produces a satisfactory picture, though minimum gain is secured this way. Often the location of the antenna in relation to hidden wires and pipes is critical. Transmission-line antennas have been installed in the cellar and have, under certain conditions, given pictures superior to the best roof-top arrays. However, with many sets and with inside installations where the signal is critical, furniture movement or lights and appliances turned on or off may affect the pictures. The movement of people within the room is often responsible for the presence or absence of ghosts.

The answer is experimentation. Check on how an indoor antenna works in that ghost-free location you have found. If the antenna must be moved for different channels, separate antennas are advisable, with independent leads and a switch, rotary or toggle.

A V-antenna, quite naturally, is ex-

cellent for surveying. Here is where the helper comes in. If personnel is easily secured, someone can operate the set and watch the ghosts, preferably test patterns in all work of this kind. Another individual can survey with the antenna. A third person can act as the liaison man.

In any survey work, the more information given the man on the roof, the more he can accomplish. There should be a continual flow of messages to tell him what's happening at the set. Instruments can show him the orientation for strongest signals, but only a confederate can tell him whether he's doing any good with the ghost problem.

A normal horizontal position of the antenna should be maintained in all search work. Incidentally, guys or ground wires for lightning have a decided effect on reflections. Avoid metal guys by substituting plastic-covered clothesline or waterproof rope on short masts if no other means of mounting is feasible.

Spot checks should be tried close to roof flashing, thus incorporating the effects of this metalwork as a director or reflector in your antenna. It goes without saying that a location may be discovered halfway up the side of the house in front of a window with metal sash or screening. Or the antenna may work well just over the front door or under the rain gutter, then that is where it belongs.

When the antenna is installed and oriented for the best picture, a little gimmick (see Fig. 1) may do more to help you than all the manufactured antennas on the market today. A simple aluminum rod or plated metal-tubing dipole six or eight feet long is phased in as illustrated and moved up or down the mast, independently of the existing antenna for best pictures. The desired vertical spacing from the fixed antenna is achieved when a half-turn of the dipole gives the maximum variation in gain between two positions 180° apart. The signal on this phasing dipole is emphasizing or de-emphasizing the signal on the other antenna, depending on whether the antenna is in or out of phase.

When this height is found, the phasing antenna can be slowly turned to minimize the ghost. This method has cancelled reflections in the worst possible receiving areas. Conveniently, too, it may be added, with little difficulty, to most existing installations. A suitable outdoor lightning arrester may be used at the junction of the two antennas thus making soldering unnecessary. All leads are secured.

Whether an antenna matches is usually of little consequence. Trifilars and line transformers are fancy gadgets. The diagrams, Fig. 3, show designs to overcome the wide lobes in the receiving patterns of elementary antennas and the means of making one dipole work for both high and low frequency. The phasing or ghost-control antenna does just this—regulates the directivity.

A dipole can be used as a parasitic and adjusted for minimum ghosts on the same mast with *no* electrical connection whatsoever to the existing antenna. It is best to try a V-antenna first, with 180° angle and maximum length. Then adjust its angle and length. If it works, a dipole may be cut and formed for a parasitic, *being careful your own body isn't indispensable to the receiving set-up.*

Rotors have become an imposing aid in subduing ghosts. Installed with proper considerations for the problems at hand, they can overcome the effects of changing conditions in the immediate area. For a good picture one day can gradually get worse with the weather, until it becomes a snake pit of confusion. A little turn of the antenna, even though a ghost persists, can clear it up until the weather is dry again.

Mechanical means of remotely orienting the antenna may correct a changed receiving condition which develops when another antenna joins the joyful throng on the rooftops, or a new water tower goes up on the pretzel plant. It can swing the antenna to cut ignition or motor noise picked up directly.

Two antennas stacked the proper distance and correctly phased can be divided—one fixed and the other turned from the armchair by a rotor. You can thus alter the pattern of the receiving antenna to suit many conditions. Its orientation, too, may have a wide range, provided it has the leads and switching arrangements.

A word of caution, however. Although a rotor serves in many situations, it cannot satisfy every person. A problem at any particular location can be quite complex. Thus the application of a rotor can easily be the most disappointing investment of all. It is often purchased as a fascinating cure for a disease that only the conscientious labor of surveying and experimental work can treat.

The lead-in length is very important in certain installations. This can be checked by splicing in temporarily several lengths of wire up to ten feet. A few trials will demonstrate whether any real significance can be attached to the effects of standing waves on the line.

Should more than one lead-in arrive at the back of a set, it's a good idea to ascertain if there is any cross-

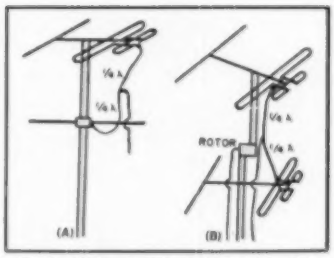


Fig. 1. (A) A 6 to 8 foot dipole phased to existing antenna. The antenna may be of any type. The quarter-wave sections of lead-in are equal and cut to frequency desired. The antennas are oriented independently for minimum ghosts. (B) A rotor turns one antenna of a stacked array, thus varying the receiving field pattern. Conical antennas may be used, but the simpler units are preferable. The rotor may also be used to turn the phase-control dipole.

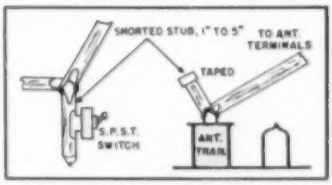


Fig. 2. How the line can be tuned for close-in ghosts, ½" or less, with a shorted stub a few inches long. The length is found experimentally with a razor blade. The stub may be installed at the antenna transformer or socket by baring ⅜" leads on the stub, inserting them in socket holes, and pushing transmission line plug in on top.

over of signals. A 250-ohm *carbon* resistor, switched across the end of the suspected lead, can act as a terminating load. A *shorted* quarter-wave stub, tuned to the desired frequency, performs best. This trap is *shorted* at the junction.

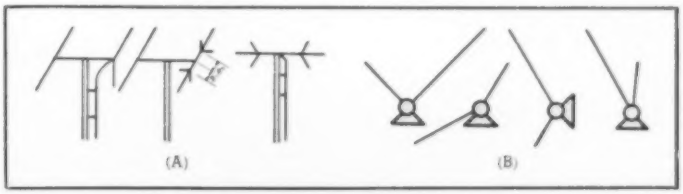
Twisting the lead-in has little effect in the reduction of interference or ghosts. It provides a little symmetry to the run, makes for a slightly more taut line, and that's all.

The first thing to do in any antenna troubleshooting is the substitution of an entirely new temporary lead-in, run as far as possible from the existing transmission line, yet without undue length.

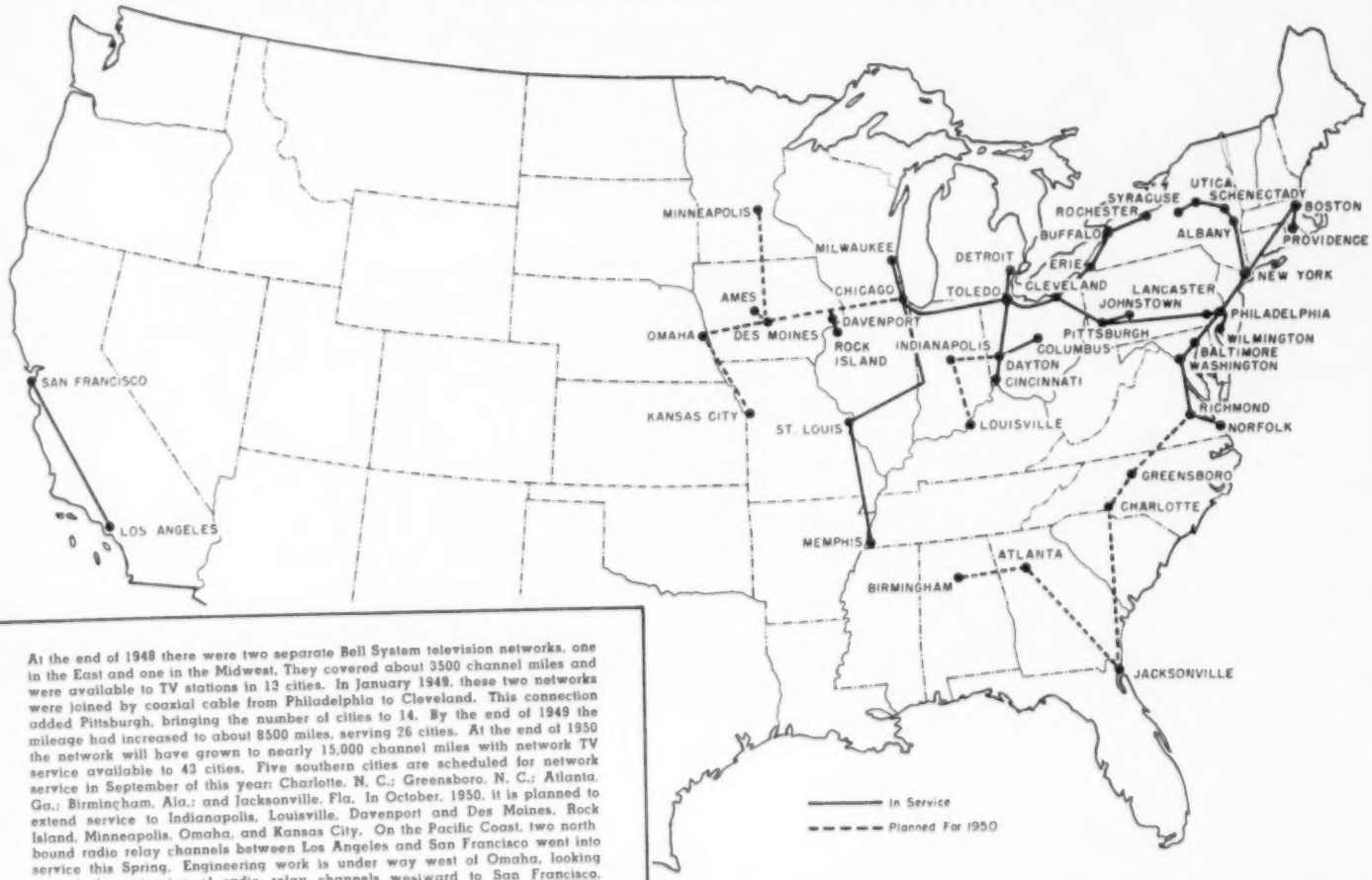
Sometimes a well-chosen folded-di-

(*Continued on page* 85)

Fig. 3. (A) Means of controlling the lobes in the antenna field pattern. The "wings" are commercially-available RCA type. Each is usually spaced nine inches from the lead-in connection but may tune the antenna better if adjusted individually on dipole arms (B) Several arrangements of an indoor "V"-type antenna which can sometimes be used.



BELL SYSTEM TELEVISION NETWORK ROUTES



At the end of 1948 there were two separate Bell System television networks, one in the East and one in the Midwest. They covered about 3500 channel miles and were available to TV stations in 13 cities. In January 1949, these two networks were joined by coaxial cable from Philadelphia to Cleveland. This connection added Pittsburgh, bringing the number of cities to 14. By the end of 1949 the mileage had increased to about 8500 miles, serving 26 cities. At the end of 1950 the network will have grown to nearly 15,000 channel miles with network TV service available to 43 cities. Five southern cities are scheduled for network service in September of this year: Charlotte, N. C.; Greensboro, N. C.; Atlanta, Ga.; Birmingham, Ala.; and Jacksonville, Fla. In October, 1950, it is planned to extend service to Indianapolis, Louisville, Davenport and Des Moines, Rock Island, Minneapolis, Omaha, and Kansas City. On the Pacific Coast, two north bound radio relay channels between Los Angeles and San Francisco went into service this Spring. Engineering work is under way west of Omaha, looking toward the extension of radio relay channels westward to San Francisco.

A V.T.V.M. For a.c.-d.c.-r.f.

Complete construction details for a battery-operated v.t.v.m. It is of good design and inexpensive to build.

Fig. 1. Front panel view of the home-built v.t.v.m. All batteries are self-contained.

By
RUFUS P. TURNER,
K6AI

IN MANY electronic tests not of a prolonged nature, a battery-operated vacuum-tube voltmeter is desirable, and often required. This is especially true when measurements are to be made between circuit points above ground, when there is a possibility that power-line hum may be transmitted by an a.c.-operated instrument into the system under test, when undesirable coupling might take place between the instrument and the system, and when measurements must be made at some distance from the nearest power outlet. In its own right, the battery-operated v.t. voltmeter is an essential instrument in the well-equipped laboratory or shop.

The usefulness of the battery-operated instrument is not questioned by well-informed laboratory technicians. However, it is the misguided opinion of some experimenters that little care need be exercised in the design and construction of this device. No notion could be more erroneous. Merely separating the electronic voltmeter circuit from the conventional a.c. power supply does not in any way eliminate the need for good design and construction procedures.

The battery-operated v.t. voltmeter described in this article was designed for maximum utility and minimum initial and maintenance costs. It may be duplicated by any engineer, laboratory or service technician having access to common tools. And this instrument will be equally useful to the engineer and amateur.

Features

Basically, the instrument described is an electronic d.c. voltmeter. An external tube-type probe enables measurement of alternating voltages in both audio and radio-frequency ranges. Voltage ranges provided are 0-1.75, 0-17.5, 0-175, and 0-1750 d.c.; and 0-1.75, 0-17.5, and 0-175 a.c. Continuous use of the probe above about 150 volts is not recommended, although intermittent use is permissible between 150 and 175 volts. The d.c. input resistance of the instrument is 10.11 megohms for all voltage ranges. The a.c. input impedance with the diode probe is correspondingly high, but is a function of the frequency of the measured voltage. The input capacitance of the probe is approximately 5 $\mu\mu$fd., and the resonant frequency of the high-frequency diode tube employed in the probe is approximately 2000 megacycles.

Two inputs are provided. These are (1) a phone-type jack for a shielded d.c. test prod, and (2) a 5-terminal male chassis receptacle for the a.c.-r.f. probe. Panel knobs control the 4-position range switch, zero adjustment rheostat, and "On-Off" battery switch. A calibration control rheostat, connected in the filament-return circuit of the 1G4/GT-G voltmeter tube, is mounted inside the instrument, since this component needs to be reset only when the tube is replaced or the calibration verified.

An additional pair of tip jacks, mounted on the front panel, allows the 0-1 d.c. milliammeter to be used in external circuits.

Desirable features of the instrument are its excellent stability, complete, single-package portability, polarity switching, low battery drain, single zero adjustment which is effective automatically on all ranges when set on any one, and its freedom from false deflections which ordinarily arise in v.t. voltmeters when measuring across circuits of various impedance values.

This v.t. voltmeter is reasonably small in size and is built in a sloping front cabinet. All batteries are self-contained. Fig. 1 is an external view of the completed instrument.

Circuit

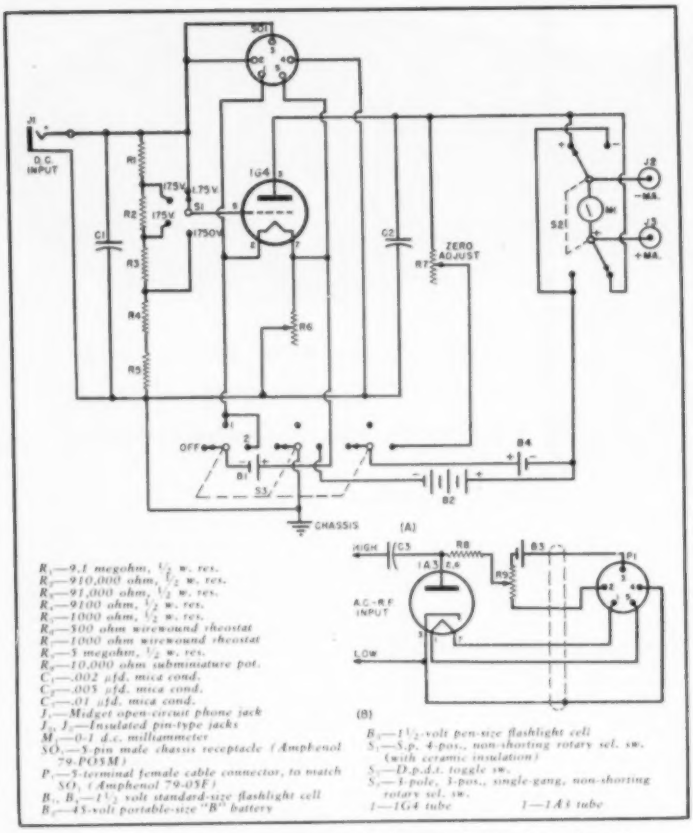
The complete circuit schematic is given in Fig. 2. The circuit for the a.c.-r.f. probe also appears in this drawing.

With the connections shown, a maximum potential of 1.75 volts d.c. is applied to the 1G4/GT-G grid. This is true regardless of the setting of the range switch, S_1. For voltage range selection, resistors R_1 to R_4 inclusive form an input voltage divider. It will be noted from the parts list that these resistors have been selected to have the new fractional values which have come into use.

The d.c. test voltages are applied through jack J_1. The d.c. test probe is provided with a shielded cable terminated by a standard phone plug. The shield braid is connected to the outer sleeve of the plug. The d.c. probe does not contain a resistor of any value.

When the calibration control rheostat, R_6, has been set properly, a 1.75-volt d.c. signal at the triode grid will deflect the milliammeter, M_1, exactly to full scale. Adjustment of this control will be described later in this article. Rheostat R_5 serves as the zero adjustment.

The filaments of both the 1G4/GT-G meter tube and the 1A3 diode probe tube are heated by a single 1½-volt flashlight cell, B_2. Triode plate voltage is supplied by the 45-volt battery, B_3. A second 1½-volt flashlight cell, B_4, furnishes a bucking voltage for setting the milliammeter initially to zero against 1G4/GT-G plate current. This arrangement was chosen in preference



R_1—9.1 megohm, ½ w. res.
R_2—910,000 ohm, ½ w. res.
R_3—91,000 ohm, ½ w. res.
R_4—9100 ohm, ½ w. res.
R_5—1000 ohm, ½ w. res.
R_6—500 ohm wirewound rheostat
R—1000 ohm wirewound rheostat
R_7—3 megohm, ½ w. res.
R_8—10,000 ohm subminiature pot.
C_1—.002 µfd. mica cond.
C_2—.005 µfd. mica cond.
C_3—.01 µfd. mica cond.
J_1—Midget open-circuit phone jack
J_2, J_3—Insulated pin-type jacks
M—0-1 d.c. milliammeter
SO_1—5-pin male chassis receptacle (Amphenol 79-P05M)
P_1—5-terminal female cable connector, to match SO_1 (Amphenol 79-05F)
B_1, B_2—1½ volt standard-size flashlight cell
B_3—45-volt portable-size "B" battery
B_3—1½-volt pen-size flashlight cell
S_1—S.p. 4-pos., non-shorting rotary sel. sw. (with ceramic insulation)
S_2—D.p.d.t. toggle sw.
S_3—3-pole, 3-pos., single-gang, non-shorting rotary sel. sw.
1—1G4 tube
1—1A3 tube

Fig. 2. (A) Circuit diagram of v.t.v.m. (B) Diagram of external a.c.-r.f. probe.

to the usual well-known resistor-bridge balancing network, since the former permits somewhat better instrument sensitivity.

The "On-Off" battery switch will appear unconventional to most readers. This is the 3-pole, 3-position rotary selector switch, S_1. Offhand, it might appear that only the filament and zero-adjuster circuits need be opened in order to switch the instrument off, and that two switch poles could do this job simultaneously. But with that simpler arrangement, the milliammeter is "slammed" on both starting and stopping the instrument. This is because the tube filament does not come up to full electron emission immediately after the filament cell is switched on, nor does it cease emitting electrons immediately after the filament circuit is interrupted. Consequently, when the filament circuit first is closed, the meter will be deflected backward by the zero adjuster cell—and when the filament circuit is interrupted (the zero adjuster cell now also being cut out of the circuit), the meter will be deflected off the top end of its scale by the slowly decaying plate current.

The 3-pole "On-Off" switch shown in Fig. 2 protects the meter from damage. When all poles are in the "off" position, all batteries are disconnected. In position 1, the 1G4/GT-G filament alone is connected, and the switch is left in this position for a few seconds to enable the filament to come up to its normal operating point. In position 2, the plate battery and zero adjuster cell both are switched on at the same instant. When shutting the instrument down, switch S_1 moves from position 2 to 1, removing both plate and zero adjuster batteries before opening the filament circuit into the "off" position.

The indicating meter is a standard 0-1 d.c. milliammeter. The resistance of this meter is not critical in the circuit, and any of the presently available models (33 ohms, 66 ohms, 105 ohms, etc.) accordingly may be used. Two panel pin-type jacks, J_2 and J_3, allow the milliammeter to be used externally. The double-pole, double-throw toggle switch, S_2, allows the milliammeter to be "turned around" in the circuit, thereby rendering unnecessary the shifting of test leads in d.c. measurements.

The plug P_1, terminating the cable of the a.c.-r.f. probe, is plugged into the chassis receptacle, SO_1, when a.c. measurements are to be made, and the alternating voltage is applied to the probe input terminals. Terminals 2 and 3 of SO_1 are connected together to complete the circuit between the contact potential bucking cell, B_3 (in the probe shield) and potentiometer R_8 when P_1 is inserted. The bucking circuit is necessary to counteract the diode contact potential which otherwise would deflect the milliammeter in absence of a signal. When a.c. or r.f. measurements are completed, P_1 must always be removed from SO_1. This automatically opens the bucking cell circuit, as well as removing voltage from the 1A3 filament.

The a.c.-r.f. probe is of the standard shunt-diode design well-known to radio experimenters. This normally is a peak reading device, but the builder may prepare a special r.m.s. scale for the milliammeter. The 1A3 tube has the advantage that its high self-resonant frequency permits operation well into the u.h.f. region.

The accuracy of the voltmeter at the various settings of the range selector switch, S_3, depends largely upon the accuracy of resistors R_1 to R_9. These components must be hand-picked. While it is desirable that each resistor have the *exact* value specified in Fig. 2, they may deviate from specified resistance values without affecting the instrument accuracy, as long as *each* resistor is in error by the same percentage and in the same direction.

It is possible to measure these resistors with an accurate ohmmeter or resistance bridge. However, a microammeter check will be desirable in most cases. Using a sensitive d.c. microammeter; R_1 must be checked at 100 volts d.c., R_2 at 10 volts, and R_3 and R_4R_5 at 1 volt. For correct resistances; R_1, R_2, and R_3 will give a reading of 11.1 microamperes, and R_4 R_5 (10,100 ohms) 111 microamperes.

Resistors R_1 to R_5 are soldered directly to the terminals of the voltage range switch, S_3, as shown in the photograph, Fig. 3.

Construction

It is convenient that no inflexible layout is required in the construction of this v.t. voltmeter. Any satisfactory instrument which the builder may have on hand may be used. Various styles of portable construction will suggest themselves to individual builders and will be entirely satisfactory. It is not imperative that the sloping panel metal case be employed.

The author's instrument is housed in a cabinet 7 inches wide, 6¾ inches high, 7 inches deep at the base, and 5½ inches deep at the top. The chassis is 7" x 7" x 2" in size.

The arrangement of controls on the front panel is shown in the over-all photograph (Fig. 1). Arrangement of components is shown in Fig. 5.

The 45-volt battery is secured in place by means of a plastic rod mounted horizontally across the top

of the battery and held tightly in place by means of long threaded rods extending through the chassis. Connections are made to this battery by means of a standard 3-pin battery plug (one pin unused). To remove the battery, it is necessary only to remove the thumb nuts holding the plastic rod, lift the rod clear of the screws, and then to lift the battery from between the threaded rods.

The two 1½-volt flashlight cells are held side by side under the chassis by a similar arrangement of yoke and long screw, and may be seen in Fig. 5. Leads are soldered directly to the brass caps and to the bottoms of the cans of these cells. While this procedure does not appear to be the best for quick replacement, it is justified by the fact that these cells need to be replaced only infrequently.

Insulated wire leads from the milliammeter, switches, jacks, and rheostat mounted on the front panel above the chassis pass through the chassis through grommet-lined holes.

Rheostat R_4 is mounted below chassis, as shown in Fig. 5, with a slot sawed in the end of its shortened shaft to permit screwdriver adjustment.

By mounting d.c. input jacks J_1, voltage range switch S_1, and a.c.-r.f. probe input receptacle SO_1 side by side along the lower edge of the front panel (see Fig. 1), short leads are insured between these associated components and the 1G4/GT-G tube.

The author kept the regular 0-1 milliampere card on the meter, in order to preserve this scale when using the milliammeter externally through jacks J_3 and J_4. Some time after the photograph (Fig. 1) was made, the voltages were inscribed on the same card just below the milliampere scale. If the reader prefers, he may replace the milliampere card with a specially-drawn voltage scale. The scale points may be obtained as will be described later under *Testing and Calibration*, and will follow the sample voltage calibration curve illustrated in Fig. 4.

Wiring of the instrument is simple and straightforward. Employ regular stranded hookup wire throughout. It is very important to observe the battery and meter polarities indicated in Fig. 2, and also to follow the tube socket wiring indicated. The latter applies particularly to the filament terminals of the 1G4/GT-G tube. Do not interchange terminals 2 and 7.

Testing and Calibration

After all wiring has been completed and inspected, the instrument may be checked and calibrated as follows:

(1) With no plugs inserted in either J_1, J_2, J_3, or SO_1, set switch S_1 to "Off," switch S_2 to 1.75 v., and switch S_3 to "Positive." (2) Set rheostat R_4 at about mid-range. (3) Switch S_1 to position 1 and allow 2 to 3 seconds for the 1G4/GT-G filament to come up to full emission. (4) Switch S_1 to position 2. (5) Set zero adjuster rheostat R_1 to bring pointer of milliammeter to zero. (6) Touch wire jumper to both terminals of jack J_3, watching milliammeter. If meter is deflected in either direction from zero, advance rheostat R_4 slightly and reset R_1 for zero (with jumper removed from J_3). Touch jumper again to J_3. When R_4 is set correctly, short-circuiting terminals of J_3 will not cause milliammeter to deflect from zero. If resistance setting of R_4 is too low, milliammeter will kick upward; if too high, meter will kick downward. It will be necessary to jockey back and forth between R_4 and R_1, while intermittently short-circuiting the terminals of J_3, until the short circuit does not upset the zero setting of the meter. (7) Connect variable d.c. voltage source (0-2 volts) to jack J_4, with negative terminal of voltage source connected to jack frame (instrument chassis). (8) With aid of standard d.c. voltmeter of known accuracy, set voltage source at various voltage steps between 0.1 volt and 1.75 volts, noting deflection of milliammeter for each step. This will yield calibration curve similar to that shown in Fig. 4.

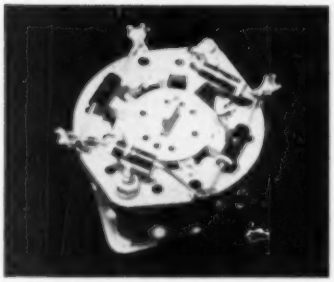


Fig. 3. Method of mounting resistors (R_1 to R_5) to switch, S_1. As in this case, a single resistor may be used for R_4 and R_5 if the exact value, 10,100, is obtained.

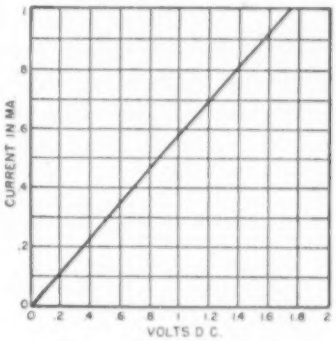
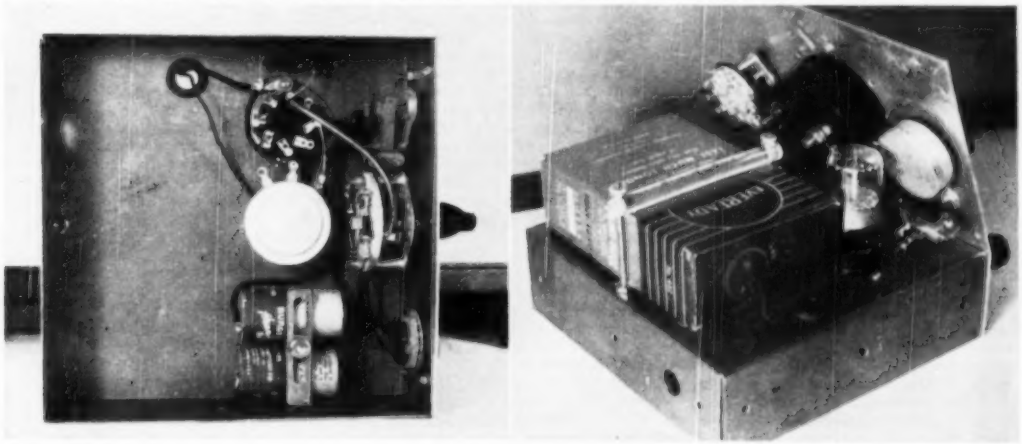


Fig. 4. Voltage calibration curve taken with switch, S_2, in the 1.75 v. position.

Some 1G4/GT-G tubes have E_c-I_c characteristic curves of such shape that the instrument calibration will not be exactly the same if the polarity of the input d.c. voltage is reversed.

(*Continued on page 98*)

Fig. 5. Top and bottom views of the home-built v.t.v.m. See Fig. 1 for identification of all panel-mounted components.



Simplified HAM TV STATION

Part 3. Concluding article of the series, covering final assembly details on the television station.

By

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Fig. 1. The corner reflector unit constructed of copper screening and mounted on a light wood frame.

THE functioning of the complete amateur television system was described in the May issue while details of the picture maker, together with the blanking generator, were given in the June issue. The present article, which is the last, gives details on making the sound, mixing it with the sync and blanked video, feeding the composite signal into the modulator, and then transmitting this on the 420-megacycle band. In addition, design data is given on the transmitting and receiving antennas, which are of the high-gain, corner-reflector type. Details are given on the converter, used at the receiving end, which transfers the 420-megacycle signal to one of the unused television channels on a standard television receiver. No change is made in the television receiver for reception of these signals, because the picture as sent should conform in most respects to that received from a standard television broadcast station.

FM Sound Generator

The 4.5 mc. FM sound generator, which is Item No. 9 in the block diagram in Part 1, is shown in Fig. 2. It is a stable Hartley oscillator which is frequency-modulated by a reactance modulator. The FM deviation of this generator is at least ±35 kc. at 4.5 megacycles. The reactance tube functions as a variable inductive shunt across the oscillator tank circuit. The choice of 4.5 mc. was made so that when this generator is fed into a modulator it produces sidebands 4.5 megacycles away from a picture carrier and acts in every respect as if it were a separate transmitter. At this frequency this sideband is then frequency-modulated and has no effect upon the picture carrier at the receiving end. A television receiver does not know the difference between this received-sideband FM signal and the sound channel produced by a separate FM sound transmitter; in fact, they are identical, the only difference being the methods by which they were produced. The construction of this unit is straightforward. The only difficulty that might be encountered is getting the proper center frequency. The center frequency control is in the cathode of the 6AC7 which should be set to mid-resistance. The trimmer across the 4.5-megacycle tank should then be adjusted for 4.5 megacycles. More or less capacitance should be added to this trimmer if the frequency is not correct. The center frequency of the oscillator should be checked by listening to it on a communications receiver.

The deviation of the generator may be checked in several ways. One way is simply to apply 60-cycle modulation (6.3 volts is adequate) to the audio input jack J_1. The frequency "spread" of the buzz in the receiver as the gain control is varied will then give an indication of the deviation. An alternate way is to remove the .1-μfd. blocking condenser C_9 from the audio input and substitute a 4.5-volt battery. By varying the gain control, the frequency shift of the oscillator may be followed as a function of the d.c. applied voltage on the grid of the reactance tube, as measured with a meter at the variable arm of the gain control R_{10}. The battery and meter are then reversed and the frequency shift in the opposite direction is followed. It will then be possible to plot a graph of deviation vs. d.c. volts input. The bias is then set at the most linear operating point. As a final check, the 4.5-megacycle generator may be used to modulate an oscillator whose frequency is in the television band and thus check the FM sound by listening to the television receiver's sound. One of the troubles that may be encountered while testing this unit is AM or FM hum. The FM hum may be the result of heater-to-cathode leakage in the 6AC7, or 60-cycle pickup on the audio input grid. The audio input leads should be well shielded as a protection against hum pickup. The 200,000 ohm resistor R_{16} (used as an r.f. choke) should be mounted directly at the grid of the 6AC7. It is suggested that the experimenter try several 6AC7 tubes and pick the one with the least hum. If AM hum is present, check the 6C4 oscillator tube and also see if there is any ripple on the "B+" feed. If the 6AC7 modulator is not on the most linear portion of its modulator characteristic, as determined by the plot of deviation vs. d.c. voltage, then the center frequency control R_{10} should be changed (using the trimmer condenser C_7 across the tank to reset to 4.5 megacycles) until the most linear operating point is reached.

To obtain the sound level required and provide for losses in the shielded lead from the generator output to the

mixer, the ratio of the 4700 to 500 ohm divider R_{11}, R_{12} may be changed until sufficient 4.5-megacycle output at the mixer is obtained. For those not wishing to send the sound with the picture or desiring to use some other communication channel, the sound generator may be eliminated.

Mixer and Modulator

If the TV receiver is to be used to furnish the sync pulses, positive as well as negative pulses are required from the receiver. The positive pulses are fed into the 12AU7 mixer tube, V_1 in Fig. 3, while the negative pulses go to the sweep generator as shown in the June issue, Fig. 2.

The positive pulses may be taken from the plate of the same tube which furnishes the negative pulses, as described last month.

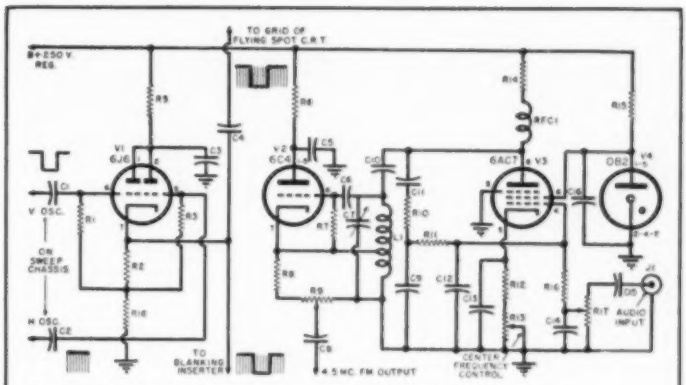
The purpose of the mixer tube V_1 in Fig. 3 is to add together and combine the FM sound with the composite sync and the blanked video. There are several different methods of accomplishing this, only one of which is shown. The mixer circuit should be wired with the same care as was devoted to the video amplifier. The purpose of the sync delay control C_3 is to have the sync follow the start of the blanking period. The time between the starting edge of the blanking and the leading edge of the sync is called the "front porch." One purpose of the "front porch" is to obtain immunity of the sync to video pulses, occurring just before the blanking period, which might trigger the sweeps prematurely. This delay time is not critical and may be adjusted over a wide range. As a preliminary adjustment, the delay condenser should be set to half value.

EDITOR'S NOTE: *The mixer tube was added to the modulator chassis after the photograph (Fig. 9, page 57 June issue) was taken. It is placed directly to the rear of the 12AU7 shown (at left) which is the blanking inserter and clipper. If internal sync is used, the bypass condenser (C_3 in Fig. 2) is removed and a lead taken from the plates of the 6J6 blanking generator is fed to the combined positive horizontal and vertical blanking input, Fig. 3.*

Injection of the FM sound is not critical either. It may be mixed at any place in the modulator, following the sync injection, the later, the better, since there is less possibility of overloading of the amplifiers. Of course, this implies that the 4.5-megacycle signal amplitude input must be correspondingly increased. The relative levels of the various signals to be mixed are as follows: Sound—50%; Picture—35%; Sync—15%.

If the sound is being received at ample strength in the receiver, then its amplitude may be reduced and the picture and sync proportions increased correspondingly. These various levels should preferably be set up by using an oscilloscope. The scope vertical deflection plates may be directly connected to the modulator output or to any of the high-level stages, such as in the plate circuit of the 6AU6 driver stage V_8. The 6AQ5 tube V_9 may sometimes flash over at the base pins. Its input video voltages should be kept at a level which prevents this flashover.

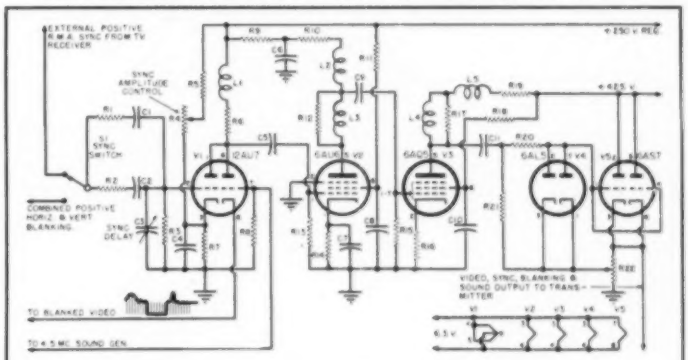
The cathode-follower 6AS7G may be replaced by three 6L6 tubes or two 807's in triode connection. The adjustment of the grid return for the 6AS7 determines the resting voltage for the transmitter carrier. The 6AL5 in the grid circuit of the cathode follower acts as a d.c. restorer. This adjustment will vary for different transmit-



R_1—1 megohm, ½ w. res.
R_2—51 ohm, ½ w. res.
R_3—100,000 ohm, ½ w. res.
R_4, R_{14}—3000 ohm, 2 w. res.
R_5—8200 ohm, 1 w. res.
R_7—50,000 ohm, ½ w. res.
R_8—4700 ohm, ½ w. res.
R_{10}, R_{16}—500 ohm pot.
R_{11}, R_{13}—3000 ohm, ½ w. res.
R_{12}—500 ohm, ½ w. res.
R_{15}—10,000 ohm, 10 w. res.
R_{17}—200,000 ohm, ½ w. res.
R_{18}—500,000 ohm pot.
R_{19}—2000 ohm, 2 w. res.
C_1—.1 μfd., 600 v. paper cond.
C_2—.006 μfd., 500 v. mica cond.
C_3—120 μfd., 250 v. elec. cond.
C_4, C_{13}, C_{18}—.1 μfd. 400 v. paper cond.
C_5, C_{11}, C_{16}—.01 μfd., 400 v. paper cond.
C_6—50 μμfd., 500 v. mica cond.
C_7—12-125 μμfd. ceramic trimmer
C_8, C_{17}—5 μμfd. ceramic cond.
C_{10}—500 μμfd., 500 v. mica cond.
C_{12}—100 μμfd., 500 v. mica cond.
C_{14}—100 μμfd., 500 v. mica cond.
L_1—40 t. #28 s.s.c. closewound on 7/16" diam. form. Tapped 8½ t. from bottom
RFC_1—2.5 mhy. r.f. choke
J_1—Input jack

Fig. 2. Schematic diagram of blanking generator for negative input pulses and the FM sound generator unit. Operation of the 6J6 was described last month.

Fig. 3. Schematic diagram of the mixer for video and blanking signals, FM sound, d.c. restorer, and the 6AS7 cathode modulator for the 420 megacycle transmitter.



R_1—100,000 ohm, ½ w. res.
R_2—33,000 ohm, ½ w. res.
R_3—150,000 ohm, ½ w. res.
R_4—50,000 ohm wirewound pot
R_5—22,000 ohm, 2 w. res.
R_6—1000 ohm, 2 w. res.
R_7—470 ohm, 1 w. res.
R_8, R_{13}—1000 ohm, ½ w. res.
R_9—68,000 ohm, 1 w. res.
R_{10}—1500 ohm, 1 w. res.
R_{11}—82,000 ohm, 1 w. res.
R_{12}—15,000 ohm, ½ w. res.
R_{18}, R_{21}—2.2 megohm, ½ w. res.
R_{16}—510 ohm, 1 w. res.
R_{17}—20,000 ohm, ½ w. res.
R_{19}—47,000 ohm, 2 w. res.
R_{20}—4000 ohm, 10 w. res.
R_{22}—33 ohm, ½ w. res.
R_{23}—10,000 ohm, 25 w. adj. res.
C_1—.001 μfd., 500 v. mica or ceramic cond.
C_2—47 μμfd., 500 v. mica or ceramic cond.
C_3—15-100 μμfd. var. ceramic, mica, or air cond.
C_4—.1 μfd., 200 v. paper cond.
C_5, C_{10}—5 μfd., 400 v. paper cond.
C_6—10 μfd., 500 v. elec. cond.
C_7—500 μμfd. mica or ceramic cond.
C_8—10 μfd., 500 v. elec. cond.
C_{9}, C_{11}—20 μfd., 450 v. elec. cond.
C_{12}—3 μfd., 600 v. paper cond.
L_1—40 μh. peaking coil
L_2—85 μh. peaking coil
L_3, L_5—110 μh. peaking coil
L_4—95 μh. peaking coil
S_1—S.p.d.t. sync switch

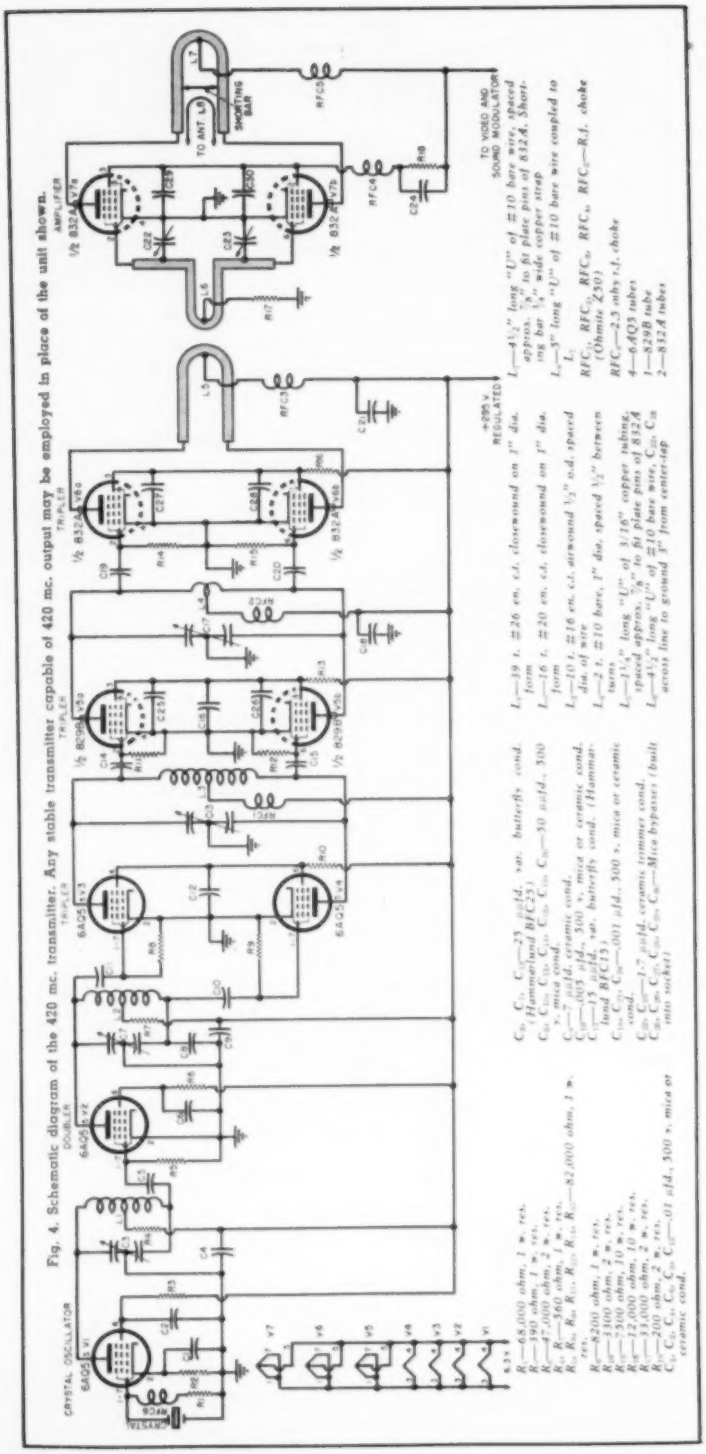


Fig. 4. Schematic diagram of the 420 mc. transmitter. Any stable transmitter capable of 420 mc. output may be employed in place of the unit shown.

ters. The performance of the video-sound modulator may be checked in the same manner as an additional video amplifier stage, and may be fed into the grid of a cathode-ray monitor tube through a resistance divider network of about ten to one (27,000 to 3000 ohms is satisfactory).

Transmitter

Any stable 420-megacycle transmitter may be used. If crystal control is provided, then frequent retuning of the transmitter becomes unnecessary. The transmitter should be constructed so that all connecting leads to the r.f. circuit are as short as possible. In fact, the final amplifier and the preceding tripler have nothing but the leads themselves for the r.f. circuit. The frequency multipliers should be built so that they are easily shielded in order to prevent radiation from any stages other than the final. The type of construction shown in the photographs lends itself very well to shielding. The sockets used for 829B's and 832A's have built-in bypasses and are available in the surplus market. The use of sockets with this bypass feature is necessary in order to get proper operation in the 420-megacycle region.

The diagram of a power supply suitable for the transmitter is shown in Fig. 8. The power transformer used was an *RCA* replacement type. The unused 5.0 volt winding is connected in series with the primary so that it opposes the primary flux, resulting in a slightly higher output voltage.

The 832A tripler plate circuit is tuned by sliding the tank along the plate leads of the 832A tube. Set screws then clamp the tank to the leads at the proper position. The grid circuit of the 832A amplifier is loaded by condensers so that it is effectively ¾ wavelength long. It is inductively coupled to the plate tank of the tripler. At 420 megacycles the final tank is tuned by a shorting bar which is moved along the tank bars. A hairpin link is used to couple inductively from the tank bars to the coax cable. The losses in the final amplifier are so great that neutralization will probably be unnecessary when the transmitter is coupled to a load or the antenna. Five out of seven 832A's tried did not need to be neutralized. The other two were neutralized by inductive link neutralization. This consists of coupling a small portion of the output energy back to the input circuit in reverse phase. Capacitance neutralizing upset the tuning and could not be satisfactorily used. The low-frequency stages of the transmitter are tuned in the same manner as for normal transmitters. Each stage is peaked to give the maximum output as observed by a pilot lamp (pink bead bulb) wired to a single-turn loop and coupled in turn to each circuit. Care should be taken in tuning the 420-megacycle circuits as the proximity effect of a single-turn loop will greatly change the resonant frequency of the circuit. The tuning procedure should be done at reduced plate voltage as the transmitter shown has no

bias except for grid bias produced by r.f. drive. These tubes run very hot and a fan blowing on them is desirable—even with the fan on they run pretty warm. Let the fan run for awhile after turning off the power before attempting to change tubes, etc.

It is not necessary to construct the complete transmitter if a transmitter of the SCR-522 type is available. This may be used in its original form to drive a tripler stage with output on the 420 mc. band. The tripler stage may be an 832A such as the one in the transmitter shown in Fig. 4 or a pair of 2C43 tubes as shown in the circuit of Fig. 7. No specifications are given for coils in this tripler due to the difficulty of specifying coils for these frequencies. In general, the coils L_1 and L_2 will be similar to the output stage of the 144 mc. exciter. L_3 and L_4 will be similar to the output circuit L_7 and L_8 of the transmitter shown in Fig. 4.

If the 2C43 or equivalent lighthouse tubes are used as triplers, a simple way to mount them for effective 420-megacycle operation is to punch holes for octal sockets in the chassis, and then clamp the lighthouse tubes in place by inserting them in the socket holes from *underneath* the chassis. Put the sockets on the tubes and then draw up the sockets tight by screws from the top of the chassis. This makes a very good low-inductance ground connection for the lighthouse tubes, as the tubes have built-in cathode bypasses. A pair of 2C43's as triplers will deliver about 7 watts average power, if driven by 10 watts at 144 megacycles. The construction of such a tripler is very simple. Because of the low plate capacitance existing in these tubes, the cathode-follower type of modulator is not necessary. The tripler stage may be directly plate modulated by a pair of 807's or 6L6's.

The transmitter with its modulator may be easily tested by feeding into the modulator a composite video source, such as derived from the output of a television receiver which is tuned to a local program. The output of the transmitter should be coupled to a dummy load consisting of a number of pilot lights in parallel. If a converter is not available, a small portion of the transmitter output can be rectified by a crystal and fed into the video stages of another standard television receiver, which can be used as a monitor. The bias on the modulator tube and the video input to the modulator should be adjusted to the level which gives the best picture on the monitor. This will not necessarily correspond to the best video level when the 4.5-megacycle sound subcarrier is added, but will check the over-all picture quality available. When the sound is added the levels will have to be reset.

Antenna

Since an antenna feed line has high losses at 420 megacycles, the length of the feed line should be kept as short as possible. A length of 100 feet of RG8/U gives a 4.5 db. loss, while RG59/U gives almost double this loss. A compromise between the antenna height and the feed-cable length should be selected. The antenna for 420 megacycles should be located high and as much in the clear as possible. Absorption by houses, trees, hills, and bridges is far greater at these frequencies than at 2 meters. The antenna itself should be made of heavy copper tubing ⅜" or ½" in diameter. The end of the coax cable feeding the antenna should have a bazooka on it 19¾" long (see ARRL or any antenna handbook). The corner reflector, shown in the photograph Fig. 1, is constructed with a wooden frame. The reflector's surface is made out of chicken wire (any size holes) or screening. The chicken wire is preferred, because it has the least wind

(*Continued on page* 71)

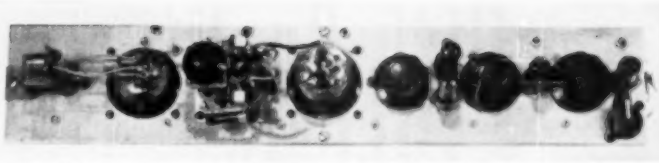
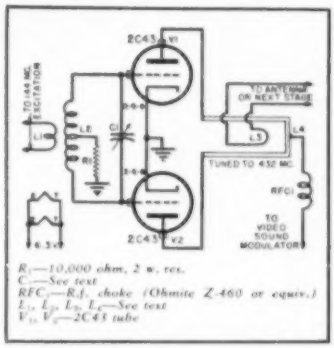


Fig. 5. Top view of transmitter. 832A tubes are used as tripler and output amplifier.

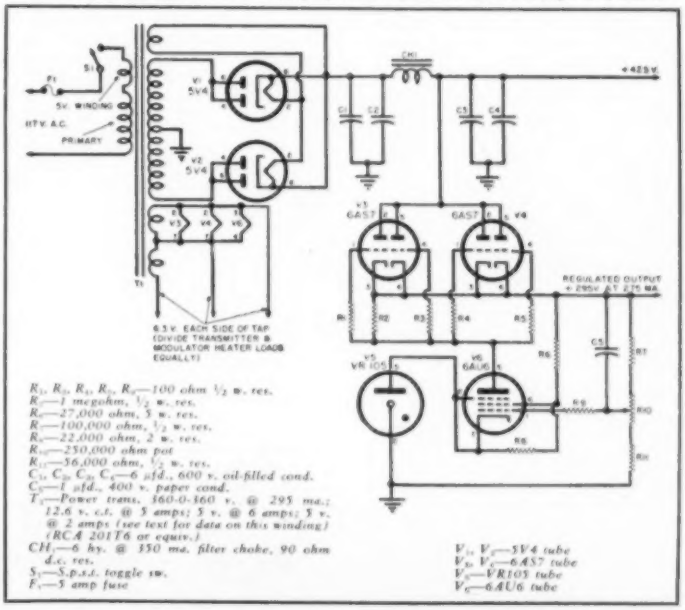
Fig. 6. Bottom view of transmitter. Sockets with built-in bypasses are used with 832A's.



R_1—10,000 ohm, 2 w. res.
C—See text
RFC—R.f. choke (Ohmite Z-460 or equiv.)
L_1, L_2, L_3, L_4—See text
V_1, V_2—2C43 tube

Fig. 7. A tripler stage, driven by a 144 mc. exciter, which may be used alternatively.

Fig. 8. Power supply capable of supplying entire transmitter, shown in Figs. 4, 5, and 6.



R_1, R_2, R_3, R_4, R_5—100 ohm ½ w. res.
R_6—1 megohm, ½ w. res.
R_7—27,000 ohm, 5 w. res.
R_8—100,000 ohm, ½ w. res.
R_9—22,000 ohm, 2 w. res.
R_{10}—250,000 ohm pot
R_{11}—56,000 ohm, ½ w. res.
C_1, C_2, C_3, C_4—6 µfd., 600 v. oil-filled cond.
C_5—1 µfd., 400 v. paper cond.
T_1—Power trans. 360-0-360 v. @ 295 ma.; 12.6 v. c.t. @ 5 amps; 5 v. @ 6 amps; 5 v. @ 2 amps (see text for data on this winding) (RCA 201T6 or equiv.)
CH_1—6 hy. @ 350 ma. filter choke, 90 ohm d.c. res.
S_1—S.p.s.t. toggle sw.
F_1—5 amp fuse

V_1, V_2—5V4 tube
V_3, V_4—6AS7 tube
V_5—VR105 tube
V_6—6AU6 tube

A High-Quality VOLUME EXPANDER

Fig. 1. Over-all view of home-made expander unit which can be built into existing cabinets.

By GLEN SOUTHWORTH

An easily-built unit which features push-pull, low distortion, and variable attack and release times.

ALTHOUGH volume expanders have been of perennial interest for years, many of the designs published have been inadequate for high quality service, and often only a limited understanding of advantages and drawbacks of these devices exists.

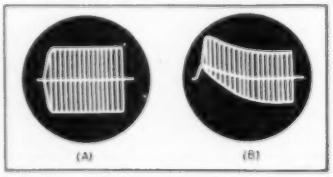
The inception of the volume expander dates back to the early thirties, a time at which poor signal-to-noise ratios in reproduction meant that a very limited dynamic range could be handled by phonograph recordings and radio broadcasts. The result of this limited range was a form of distortion disagreeable to listeners accustomed to the wide changes of dynamic intensity found in live orchestral music. As a consequence, the innovation of volume expansion was hailed with considerable enthusiasm at its first demonstration.

Since that time, two factors have tended to dim public interest in volume expansion. One of these is, of course, the vastly improved signal-to-noise ratios brought about by advances in the audio art. A second factor of probably almost as great importance is the fact that large sections of the listening public have become as accustomed to limited dynamics as to limited frequency response. Nevertheless, due to the revived interest in high quality, the expander should be considered as a potentially desirable device, especially by those who may own a considerable collection of the older 78 r.p.m. recordings.

A number of different methods may be used to secure volume expansion, or conversely compression, but in general the most widely used method is to rectify and filter a portion of the input signal and apply the resulting d.c. voltage to one of the elements of a variable mu tube, consequently changing the gain of the system in accordance with the level of the input signal. Most of the circuits of this nature are single-ended, resistance-capacitance coupled devices and suffer from a number of inherent defects. One of the chief disadvantages is the fact that the time constants of the expansion must usually be of such a nature that it takes a considerable amount of time, possibly several seconds, to build up to full expansion. This effect is particularly objectionable on passages containing sudden orchestral peaks and can entirely alter the dynamic effects of the music. Likewise, single-ended operation may mean appreciable second harmonic distortion, due to the nonlinear characteristic of the variable mu tube, and introduce thumps or blocking when used with an amplifier with superior low frequency response.

The push-pull expander circuit, shown in Fig. 3, overcomes nearly all of the objections previously mentioned, and is patterned in large part after the commercial limiting amplifiers used to produce the initial volume compression. A number of factors were considered in the design shown, first of which was the ability to achieve relatively great amounts of expansion, a range of twenty decibels or better being easily obtainable. Secondly, that harmonic and other distortion products such as "thumps" should be as low as practicable for use with associated high quality equipment, and, third, that a very low attack time should be available as well as provision for variable attack and decay rates.

Fig. 2. Oscilloscope traces showing the correct (A) and incorrect (B) balancing of expander output stages. A tone burst obtained by keying an audio oscillator is used in making circuit adjustments.

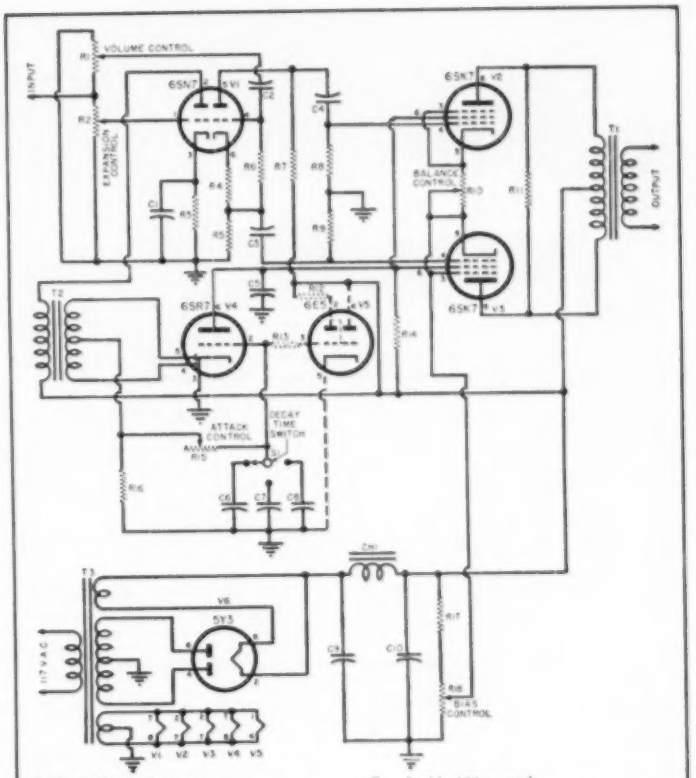


The time constants of the expander circuit are determined by the values of the rectifier load resistor, the filter condenser, and the impedance of the rectifier as well as the audio transformer and power source. The attack time of the expander will be dependent upon value of the filter condensers, C_6, C_7, C_8, and the series charging resistance. The release time will be controlled by the value of these filter condensers and the value of the load resistor R_{16}. In general, these values should be chosen for a release time of several seconds to prevent "choppiness" in the reproduction. For certain types of music, such as band, a shorter period of decay seems satisfactory and unusual effects can be produced, such as the apparent effect of very dead acoustics due to the rapid decrease in gain effected. As mentioned previously, the attack time will be dependent upon the values of C_6, C_7, C_8 and the series charging resistance. With the circuit shown, a minimum attack time of approximately one two hundredth second may be achieved when C_7 equals .25 μfd. This attack time may be greatly lowered, if desired, by decreasing the impedance of the charging circuit. One well-known commercial limiting amplifier achieves a very low attack time by use of push-pull 6Y6 tubes driving a 6X5 rectifier. Extremely low attack times are, however, of questionable value in an expander, particularly

where vinylite records are being reproduced, due to the fact that ticks or pops in the recording may initiate expansion with corresponding undesirable variations in level. Similarly, with some recordings it may be desirable to introduce a relatively long attack time to reduce the effect of sudden peaks of short duration. The schematic shows provision for varying both attack and decay rates.

In many expanders, expansion is achieved by applying a positive voltage to the control grid of the variable mu tube. This has the disadvantage that the grid may be driven positive by peaks, and as a result, in the design shown, the control voltage is applied to the screen grids of the variable mu tubes and the circuit set up in such a way that the screen voltage will not increase beyond a certain point no matter how hard the circuit is driven. This has the further advantage that only fixed amount of expansion can be obtained, the amount of expansion being determined by the voltage applied to the cathodes of the two 6SK7 tubes. If very little grid bias is generated, then little or no expansion will occur, however, with grid bias near the cut-off point, twenty to thirty db. expansion may be achieved. Although it is a temptation to bypass the cathode resistor with an electrolytic condenser in order to reduce possible hum and achieve increased gain, this is not necessarily desirable as it may cause overexpansion on sudden peaks, due to the change in cathode current being momentarily retarded. A similar effect is sometimes found in commercial compressors, in which the initial portion of a sudden high level passage is overcompressed. This, of course, produces a dynamic distortion which even a very fast acting expander can not be expected to correct entirely.

A second factor of importance is that the two variable mu tubes in the expander be adequately balanced. Failure to do this may result in increased distortion and thump as well as possible poor frequency response. Although in most commercial instruments, tube balancing is achieved by adjusting the plate currents to identical values under steady state conditions, a more satisfactory method seems to be through the use of an oscilloscope and an interrupted sine wave source. As shown by the accompanying oscilloscope patterns, Fig. 2, the expansion caused by a sudden tone burst may result in a strong d.c. component and harmonic distortion during the initial portions of the expanded signal in an unbalanced system (B). The pattern (A) shows the system balanced to provide symmetrical output. The circuit diagram illustrates the balancing arrangement used by the author, in which a five thousand ohm variable resistor, R_{20} is inserted in the cathode lead of one of the tubes. Adjustment of this control provides additional grid bias and introduces some degeneration, but as it controls only one side of the circuit, the locations of



R_1, R_2—500,000 ohm pot.
R_3—1000 ohm, ½ w. res.
R_4—1500 ohm, ½ w. res.
R_5, R—100,000 ohm, ½ w. res.
R_6, R_7, R_8, R_9—500,000 ohm, ½ w. res.
R_{10}—5000 ohm, 10 w. wirewound var. res.
R_{11}—50,000 ohm, 1 w. res.
R_{12}—1 megohm, ½ w. res.
R_{13}—2 megohm, ½ w. res.
R_{14}—1 megohm pot.
R_{15}—1 megohm, ½ w. res.
R_{17}—10,000 ohm, 5 w. wirewound res.
R_{18}—5000 ohm, 10 w. wirewound var. res.
C_1—25 μfd., 25 v. elec. cond.
C_2, C_3—.01 μfd., 400 v. cond.
C_5, C_6—.02 μfd., 400 v. cond.
C_8—.1 μfd., 200 v. cond.
C—.25 μfd., 200 v. cond.
C_9—.5 μfd., 100 v. cond.
C_{10}, C_{11}—12 μfd., 450 v. elec. cond.
CH_1—10 hy., 40 ma. d.c. filter choke
S_1—S.p.8-pos. rotary sw.
T_1—Interstage trans., 20,000 ohms c.t. into 50,000 ohms (Chicago Transformer BI-6 or equiv.)
T_2—Interstage trans. 1:1 ratio (Chicago Transformer IN-16 or equiv.)
T_3—Power trans. 225-0-225 v. @ 40 ma.; 5 v. @ 2 amps.; 6.3 v. c.t. @ 2 amps. (Chicago Transformer PCC-40 or equiv.)
V—6SN7 tube
V_2, V_3—6SK7 tube
V_4—6SR7 tube
V_5—6E5 tube
V_6—5Y3 tube

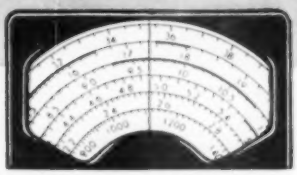
Fig. 3. Diagram of expander featuring push pull operation and variable attack and decay rates.

the two 6SK7 tubes may need to be reversed in order to achieve correct balance. In the event that a scope is unavailable, the point of balance may be roughly determined by playing a piece of music with the expansion control on but with no signal applied to the grids of the 6SK7's. The balancing control may then be adjusted for minimum noise or thump introduced by the expander action.

As it may be desired to adapt this general circuit to other requirements, or to incorporate it in new equipment, a number of other considerations might be mentioned. In general, the factors that are of importance in an expander, such as balanced circuits, attack and decay rates, etc., hold true when designing a good volume compressor for communications or recording work. In fact, if desired, the circuit shown may be easily modified for use as a compressor by reconnecting the audio rectifier section so that a positive voltage is applied to the grid of the 6SR7 tube, although this will require a separate rectifier. Another method is to take the negative d.c. potential already available and apply it to the control grids of the 6SK7 tubes. For best results in this case, the screen grid voltages should be well regulated and proper adjustments made in the cathode bias. If desired, the 6SK7's may be triode connected although it will probably require a higher compression voltage. To secure a delay in order that compression does not occur until a certain level is reached, a negative voltage may be inserted in series with the output of the audio rectifier. In the expander design as shown, some delay voltage is

(*Continued on page 96*)

International SHORT-WAVE



***Compiled by* KENNETH R. BOORD**

MSF is a *new* frequency check station established at Rugby, England, to improve calibration facilities and provide frequency checks in the European areas. Is still experimental and is restricted in operations due to possible mutual interference with WWV, Bureau of Standards station in Washington, D.C., USA. MSF operates on 60 kc. at 0529-0545; on 5.000 at 0044-0115, and on 10.000 at 0129-0200. Reports are requested to the Director, National Physical Laboratory, Teddington, Middlesex, England. Technical responsibility has been assumed by the G.P.O. Constant monitoring is maintained at the National Physical Laboratory. (Patrick, England, Radio Australia, others)

* * *

IMS Report

Edgar W. Parmenter, general manager, International Monitoring Service, San Carlos, California, writes: "The IMS would like to acknowledge and thank the many hundreds of applicants who have offered their services to IMS's organization. The office of the coordinator is working day and night to attempt to make the utmost practical use of every applicant who has filed a formal application. We would like to announce that it will take up to 30 days after receipt of application before action can be taken upon the volunteer. We are still awaiting further applications from the U.S. territories or other possessions—particularly from the Territory of Hawaii."

* * *

Swedish DX Sessions

Summer schedule for *"Sweden Calling DX-ers"* is 0215-0230, 6.065, 15.155; 1015-1030, 10.780, 15.155; 2015-2030, 10.780, 15.155, *all on Saturday only.* (Skoog, Sweden)

* * *

This Month's Schedules

(*NOTE:* At the time this was compiled, some stations had not yet gone on Summer Time; in such cases you may find schedules by now have been *advanced by one hour.*—KRB)

Angola—Radio Diamang, CR6RG, 8.242, noted 1355 to sign-off 1430; heard another day signing on 1330; severe CWQRM in England. (Pearce) At the time this was compiled, Boice, Conn., reported *Radio Clube do Huambo,* 11.925, still good signal around 1330 to 1530 sign-off; some CWQRM at times.

Australia — VL13, 9.500, Sydney, noted 0100 with BBC news relay. (Leary, Ind.)

Austria—Blue Danube Network, approx. 9.533, noted in Britain 0400 with news; later on is buried by HER4, 9.535, Berne. (Pearce)

Azores—Ponta Delgada is now on 11.094, 1400-1500; 4.845, 1600-1800. (Pearce, England)

Bechuanaland—The N.Z. DX Times says Nafeking is heard on approx. 8.240 to sign-off 1430; believed to come on air 1200.

Brazil—PRL5, 11.950, Rio de Janeiro, heard 0545; news in Portuguese 0600. (Cushen, N.Z.)

Canary Islands—EA8AB, 7.518 (approx.), noted signing on with orchestral music 1700; news in Spanish 1750; off 1800 with "Viva Franco! Arriba Espana!" and music. (Pearce, England)

China—Dilg, Calif., writes: "The Communist-Chinese outlets made many changes recently; I believe that 10.260 and 15.068 which announce as 'Radio Peking' are used in the Overseas Service while the others may be in the Home Service; have noted after the *English* (around 0830-0850) they use what seems to be Thai at 0900-0930; at 0930-1000 a language unknown, but 1000-1030 seem to use Burmese, with sign-off 1030. At 0800-0830, most of the Communist-Chinese channels take the same Chinese program (talk); even Shanghai, 5.985, takes this program which is a relay of 10.260. There is a Chinese station on approximately 5.910 which also takes this 0800-0830 Chinese session, but I am inclined to believe it is a Manchurian outlet, probably Mukden formerly on 3.500; just above this—around 5.920—is an unknown, very weak with bad QRM, has a Russian flavor, but is too weak to copy; not confused with 5.940 which is a strong Russian in California." (While the 15.068 outlet says "Radio Peking," I believe this may be Chungking or Nanking with a relay from Peking.—KRB)

Colombia—Stark, Texas, believes the Colombian outlet on approximately

(*Continued on page* 122)

Arne Skoog, DX Editor of "Radio Sweden," tunes the short-wave bands while at the microphone of the Swedish Broadcasting Corporation. According to Arne, he feels that it is good business for DX-ing to tell the listeners on the domestic network what is to be heard on s.w. by means of "sweeps" at the open mike.

(Note: Unless otherwise indicated, all time is expressed in American EST; add 5 hours for GCT. "News" refers to newscasts in the English language. In order to avoid confusion, the 24 hour clock has been used in designating the times of broadcasts. The hours from midnight until noon are shown as 0000 to 1200 while from 1 p.m. to midnight are shown as 1300 to 2400.) The symbol "Y" following a listed frequency indicates "varying." The station may operate either above or below the frequency given.

The "Sumodget" TRANSMITTER

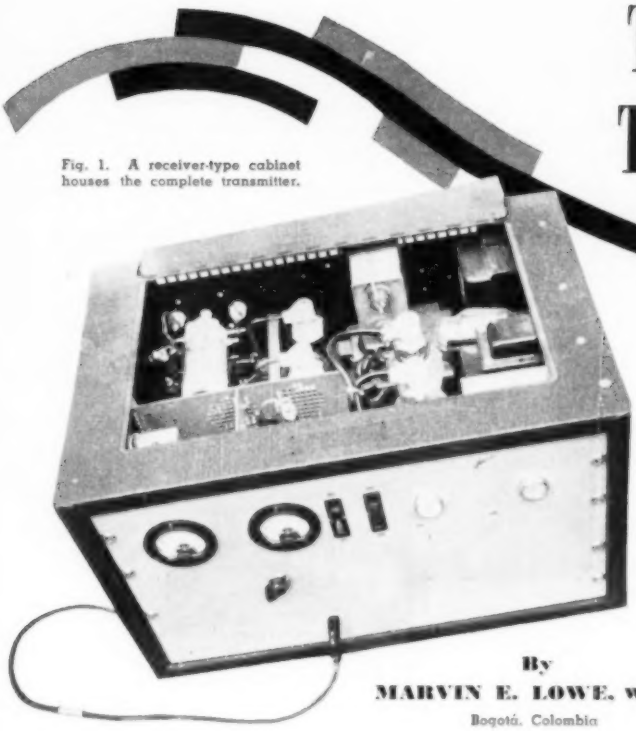


Fig. 1. A receiver-type cabinet houses the complete transmitter.

By
MARVIN E. LOWE, W6NBF
Bogotá, Colombia

Construction details on a compact, medium powered transmitter using Taylor supermodulation system.

"QUALITY items come in small packages" is an old saying, which the author feels adequately covers the transmitter to be described here.

Supermodulation has been used by the writer in two transmitters during the last several months and the results have been almost phenomenal. During hundreds of QSO's over HK3ME the fellows on the "other end" have been very enthusiastic and flattering in their reports on the signal and a great majority of them have shown great interest in the supermodulation system. Most of them have asked a great many questions regarding it. Many had read the two articles written by the inventor and patent owner, R. E. (Bob) Taylor, in the September and October, 1948, issues of RADIO & TELEVISION NEWS but, although intrigued, most found them to be "way over their heads." It appears that fewer had read Rufus Turner's article in the June, 1949, issue principally because it described a transmitter of very low power while most were interested in transmitters in the medium power range, 250 to 500 watts input. It was with this in mind that the transmitter shown in Fig. 1 was designed and built.

The first of the two transmitters to be built by the author is believed to be the first in amateur service in any part of the world outside of the U. S. and Canada to use supermodulation. This transmitter was first constructed to use conventional high-level plate modulation, later changed to NBFM and screen-grid modulation. From that set-up it was then modified to supermodulation. The author is an inveterate experimenter.

A great reduction of size and equipment is possible when a transmitter is designed and built to use the supermodulation system and the author feels that this is the most practical advancement to come to ham radio in many years. Just note some of the advantages of this system as listed below:

1. Substantial (up to 50%) reduction of components for more power output as compared to conventional plate, or high-level modulation, while still retaining all of the advantages of AM.

2. About four times the audio or sideband power, as compared with conventional plate modulated transmitters, with no over-modulation or peak clipping. See Taylor's articles, mentioned before, for full explanation.

3. Virtual elimination of BCI and TVI because of absence of audio splatter, shot-effect, or negative peak clipping.

4. No audio power is developed thus eliminating the extra-heavy duty power supply or extra power supply necessary for the conventional audio power tubes.

5. Only positive audio is generated and the carrier is automatically suppressed, or compressed, during modulation, resulting in greatly decreased receiver noise and practical elimination of heterodynes at the receiving station. This makes for more 100% QSO's regardless of power.

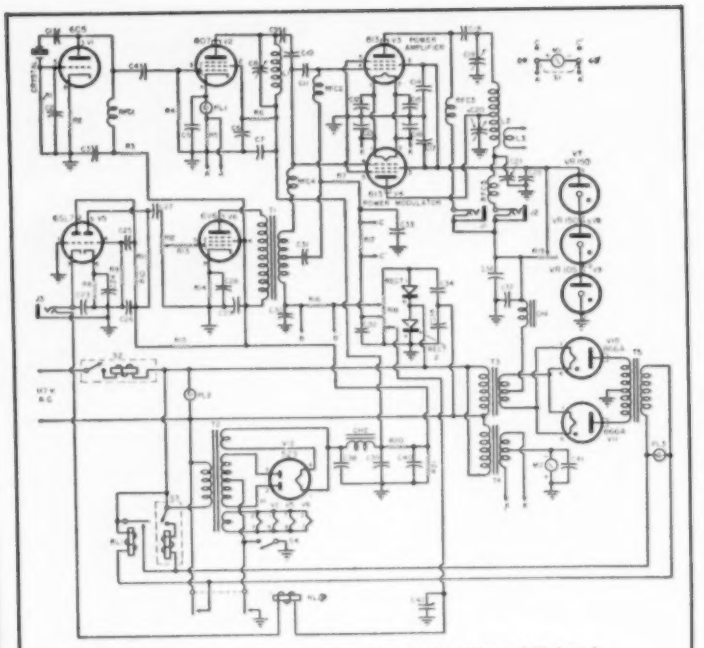
6. Unlike the single-sideband-suppressed-carrier no additional tubes, filters, phasing networks, etc., are necessary to accomplish carrier suppression, nor is any special receiver, modification thereof, or handling necessary to receive a supermodulated signal.

7. Like narrow-band frequency modulation, very little audio voltage is necessary to accomplish supermodulation but, unlike NBFM, the signal is tuned in on a conventional receiver in a normal manner and without any type of adapter or "gadget."

8. Final tubes, the power amplifier (PA) and the positive modulator, may be operated at their full c.w. ratings because no audio voltage is added to the final tank circuit or applied to the final tubes.

9. Only one high-voltage power supply is needed, having a current rating capable of handling the two tubes in the final at their c.w. ratings. This eliminates the high-voltage, high-power, power supply or the additional higher current rating normally necessary for high-level modulated finals using audio power modulator tubes.

10. Supermodulated signals occupy only about one third as much of the frequency spectrum as does a conventional AM transmitter. HK3ME has been checked here in Bogotá, Colombia by HK3AB, and others, while being 100% modulated by a 3000 cycle sine wave and the signal measured 4 kilocycles wide, with the signal pinning the needle on the receivers. All conscientious amateurs should be interested in this feature as it will allow almost three times as many phone stations to occupy our crowded bands if all were using similar equipment.



R_1—50,000 ohm, 1 w. res.
R_2, R_8—1000 ohm, 1 w. res.
R_3, R_4, R_{15}—20,000 ohm, 1 w. res.
R_5—10 ohm, 1 w. res.
R_6—25,000 ohm, 10 w. wirewound res.
R_7—5000 ohm, 20 w. wirewound res.
R_9—220,000 ohm, 1 w. res.
R_{12}, R_{13}—180,000 ohm, 1 w. res.
R_{14}—250,000 ohm pot.
R_{16}—10,000 ohm, 1 w. res.
R_{17}—470 ohm, 2 w. res.
R_{18}, R_{19}—20 ohm, ½ w. res.
R_{20}—15,000 ohm, 100 w. wirewound res. (with 3 sliders)
R_{21}—20,000 ohm, 200 w. wirewound res. (with slider)
R_{22}—8000 ohm, 100 w. wirewound res.
R_{23}—15,000 ohm, 25 w. wirewound res.
C_1, C_2, C_6, C_7, C_{13}, C_{15}, C_{17}, C_{19}, C_{20}, C_{27}, C_{28}, C_{41}—.01 μfd., 500 v. mica cond.
C_3, C_{11}—100 μμfd., 500 v. mica cond.
C_4—50 μμfd., 500 v. mica cond.
C_5—10 μfd., 150 v. elec. cond.
C_8—100 μμfd. double-spaced var. cond.
C_9, C_{10}—250 μμfd., 5000 v. mica cond.
C_{12}, C_{14}—.001 μfd., 1000 v. mica cond.
C_{16}—.002 μfd., 2500 v. mica cond.
C_{18}, C_{30}—150 μμfd., 6000 v. var. cond.
C_{21}—.002 μfd., 12,500 v. mica cond. (3 amps r.f.)
C_{22}, C_{23}, C_{37}—8 μfd., 600 v. elec. cond.
C_{25}, C_{26}, C_{42}—.001 μfd., 500 v. mica cond.
C_{24}, C_{29}—10 μfd., 50 v. elec. cond.
C_{31}—.5 μfd., 600 v. cond.
C_{32}, C_{33}—2 μfd., 400 v. cond.
C_{34}—4 μfd., 400 v. paper cond.
C_{36}, C_{38}, C_{40}—10 μfd., 450 v. elec. cond.
C_{39}—4 μfd., 2500 v. oil-filled cond.
C_{43}—20 μfd., 150 v. elec. cond.
RFC_1, RFC_3, RFC_4—2.5 mhy., 125 ma. r.f. choke
RFC_2—2.5 mhy., 500 ma. r.f. choke
RFC_5—All-band, 800 ma. r.f. choke
T_1—Universal 10 w. driver (trans., pentode plate to class B grids
T_2—Power trans., 550-0-550 v. @ 200 ma.; 6.3 v. @ 5 amps.; 5 v. @ 3 amps
T_3—Fil. trans., 2.5 v. c.t. @ 10 amps.
T_4—Fil. trans., 10 v. c.t. @ 11 amps.
T_5—Plate power trans., 1775-0-1775 v. @ 400 ma.
CH_1—10 hy., 400 ma. filter choke
CH_2—10 hy., 200 ma. filter choke
RL_1—S.p.s.t. relay, 117 v. a.c. @ 30 amps.
RL_2—D.p.s.t. relay, 30 v. d.c. @ 20 ma.
S_1—D.p.3-pos. rotary sw.
S_2, S_3—117 v. a.c. @ 15 amps. circuit breaker
S_4—S.p.s.t. toggle sw.
L_1, L_2, L—See text
J_1, J_2—Closed circuit jack
J—1-circuit jack
$Rect_1$, $Rect_2$—100 ma. selenium rectifier
PL_1—120 v., 15 w. Mazda lamp
PL_2, PL_3—120 v. candelabra lamp
Crystal—For operating band (see text)
M_1—0-50 ma. d.c. meter
M_2—0-500 ma. d.c. meter
V_1—6C5 tube
V_2—807 tube
V_3, V_4—813 tube
V_5—6SL7 tube
V_6—6V6 tube
V_7, V_8—VR150 tube
V_9—VR105 tube
V_{10}, V_{11}—866A tube
V_{12}—5Z3 tube

Fig. 2. Schematic diagram of the complete transmitter including power supplies.

Two other factors, strictly local, prompted the building the above mentioned transmitters (others are being planned). Bogotá is located at 9000 feet above sea-level and the relatively rarified air places modulation transformers under a definite handicap due to the fact that they are normally designed for more "normal" altitudes. The transmitters are also used down in the steaming hot jungles where ambient temperatures are very high, as is the humidity. In both cases the modulation transformers in conventional AM transmitters are the main source of trouble due to burnouts resulting from high surges of audio power. Supermodulation eliminates this transformer along with the inherent losses present in this piece of apparatus and the losses always present when transferring the audio power from the modulation transformer to the r.f. load.

In the interest of brevity the author especially recommends a careful rereading of the previous articles, mentioned before, for most of the answers to the theoretical questions which may come to his mind. This article will be confined generally to explaining those parts of the circuit and answering the questions on the operational characteristics most frequently asked.

The Circuit

The circuit of the transmitter to be described is shown in Fig. 2. This transmitter is operated on 40 meter phone *(Editor's Note: The 40 meter band is not open to phone operation in U.S.A. and possessions.)* but, as may be seen, the exciter up through the plate tank circuit of the 807 stage is conventional, except PL_1 in the cathode circuit (to be explained later), and any suitable exciter with the same output could be used, terminating at the frequency on which it is desired to operate the final. The original transmitter built by the author operates on 10, 11, and 20 meter phone using a 6F6 Clapp e.c.o., 6F6 doubler, 807 driver amplifier and 813's in the PA and positive modulation stages.

PL_1 is a 15 watt tungsten filament lamp of the 110-120 volt variety and has been used by the writer in all 807 r.f. stages constructed in the past few years. It is a very versatile item as it gives absolute protection to the 807 tube in case of failure of excitation or off-resonance tuning because of tungsten's characteristic of increasing resistance with an increase in current, thus, if the plate current soars for any reason the bias on the tube also increases and holds the plate current within safe limits. Unlike a fixed cathode resistor, very little net plate voltage is subtracted from the plate supply when the plate circuit is in resonance. Also it has never been found necessary to use any parasitic suppressors with an 807 when using this lamp. Apparently the inductance of the lamp has some effective suppression action.

C_9 looks superfluous but it was found that more than sufficient excitation was available from the 807 stage and this condenser served to reduce the excitation. Originally C_{18} and C_{30} were 100 μμfd. variables but these were later replaced by fixed mica condensers.

Two separate variable condensers are not necessary in the final tank circuit and a split-stator condenser could have been used but considerable "cut and try" was found necessary in the first transmitter in order to find the proper point to connect the positive modulation circuit, therefore, two single-section condensers were employed in this transmitter in order to use a center-tapped coil and dip each tube separately. Some interaction is present between the two circuits but adjustment is simple.

It is important that the screen-grid supply for the 813's be regulated or be a completely separate supply with good regulation. Erratic operation will result if this is neglected.

The two-tube speech section, consisting of the 6SL7 and 6V6 tubes, is conventional and is designed for use with a T17-B surplus single-button carbon microphone with push-to-talk operation. Any speech amplifier with comparable output will be satisfactory.

Switches S_2 and S_3 are test switches and will be left open for push-to-talk operation. It will be noted that the bias will be changed slightly on the final tubes when push-to-talk operation is compared to "test" operation. This change will be slight, however, and will not materially affect operation. The entire control system may be changed for that matter because the entire transmitter is conventional except for the grid and plate circuits of the final.

The bias supply shown provides 200 volts. With this type of circuit it is not possible to connect the transmitter to an earth ground and the constructor may desire to use another type. Any supply of the same rating may be used in its place.

The 0-500 ma. meter in the secondary center-tap of T_1 reads the combined currents of both 813's. Jack J_1 is provided for insertion of a 0-300 ma. meter to read the plate current of the PA tube, while J_2 is for the same purpose with the positive modulation tube. The jacks are used only during the initial tune-up operation and subsequent periodical checking. The common meter (0-500 ma.) serves adequately for regular operational indication.

While T_1 furnishes only 1500 volts to the plates of the PA and positive modulation tubes it is entirely possible, and permissible, to use 2000 volts on 813's in this system of phone transmission, thereby increasing the input to the final to approximately 750 watts. No changes need be made except to increase the value of R_{10} and the available bias voltage.

C.W. Operation

Although not used in this particular transmitter, c.w. operation may be accomplished by very simple means. It is only necessary to connect a d.p.d.t. switch or relay so that the bias tap for the positive modulation tube is switched to another tap on the bias supply bleeder to reduce the bias voltage to a value just slightly more than that furnished the PA tubes. The other set of contacts should switch the 6V6 grid directly to ground.

This is another great advantage of the supermodulation system. Only two or three small low-level audio tubes, depending on the individual speech-amplifier used, are standing idle during c.w. operation. *Not* about half of the equipment as is the case with conventional AM transmitters.

Your own preferred method of keying may be used.

Construction

The photographs of the transmitter clearly show many of the construction details although it is felt that most readers will have their own pet ideas which will be just as good, therefore, little will be said regarding this feature. Also the author believes that any person having the experience necessary to build and operate a transmitter of this power rating will be capable of working out all details. After all, the same rules apply here as in any other transmitter.

The usual precautions for beam power tubes should be observed in this transmitter. Isolation of grid and plate circuits, leads as short as possible, and adequate bypassing are basic points to watch.

It is advisable to check for oscillation and parasitics before attempting any of the operating adjustments.

Several articles covering the taming of beam tubes have been published.

L_6, the 807 plate tank coil, is entirely conventional and will be the same as normally used with C_5 to resonate at the desired frequency. Data may be obtained from any radio handbook or commercially manufactured coils may be used.

L_7, the final tank coil, is definitely unconventional as to its inductance and no available coil tables will suffice in its direct calculation. Roughly speaking it may be said that a coil designed to resonate at twice the frequency desired, with the variable condensers used, will be OK. The coil shown in this particular transmitter is a 500 watt surplus coil designed to operate at 9-10 megacycles with a 200 μμfd. single-section condenser in a parallel-tuned circuit.

If a split-stator condenser is used in the final tank circuit it will be necessary to find the proper point to connect the stator of the condenser and the plate of the positive modulation tube by the "cuss and try" method. This connection must be made on the coil at a point where the plate current of each tube, as measured in jacks J_1 and J_2, dips at the same setting of the tank condenser.

In the original transmitter a split-stator tank condenser having two 50 μμfd. sections is used. For twenty meters the tank coil has 6 turns, 2½ inches in diameter, 6 inches long, constructed from ¼ inch copper tubing and tapped at 2½ turns from the d.c. or power supply end. The ten meter coil, also ¼ inch copper tubing, has 3 turns, 2 inches in diameter, 6 inches long and tapped at 1¼ turns. As in practically all cases, individual layouts may change these dimensions somewhat.

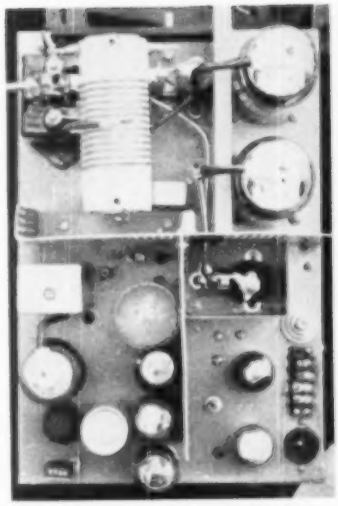
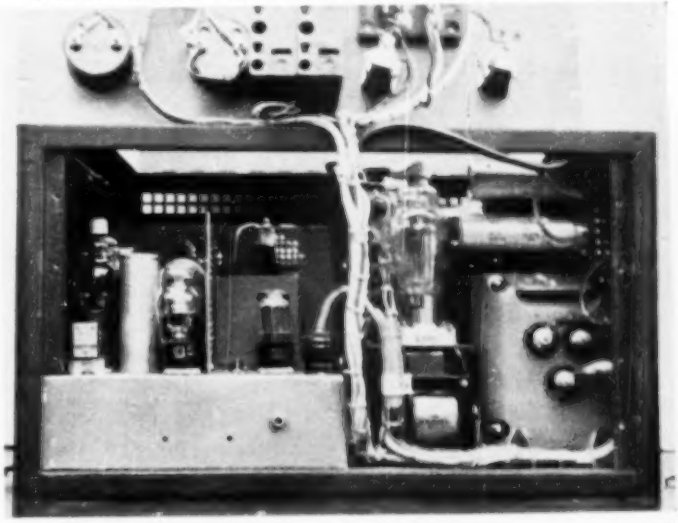


Fig. 3. Top view of r.f. and modulator section.

Adjustment and Operation

After double-checking all connections for correctness you are now ready to close S_1. After sufficient warm-up time has been allowed for the filaments (3 minutes is always desirable where mercury-vapor tubes are used), close S_2 and, with S_3 on position A, adjust C_5 to resonance as indicated

Fig. 4. Front view of the transmitter with panel removed to show the parts layout.



by a dip in the reading on the 0-50 ma. meter.

Plug the microphone into J_1 and test the speech amplifier by any conventional means. A pair of headphones connected through a .01 μfd., 500 volt condenser from the 6V6 plate to ground will do. A small PM speaker connected in the same manner will also serve. Open S_4.

Next adjust the bias bleeder (R_{10}) approximately as follows: Upper tap to about 150 volts; center tap to about 90 volts; and the lower tap to about 15 volts.

Close S_4, then S_1 and with a 0-300 ma. meter plugged into J_1 bring the PA circuit into resonance, then transfer the 0-300 ma. meter to J_2 and do the same to the positive modulation circuit. Open S_5 and S_4.

Connecting the antenna or antenna coupling network, as the case may be, and proceeding to load the final is apparently the point where most amateurs run into trouble with supermodulation.

The writer has found that very few new or recently licensed hams know anything about grid modulation and most of the "old-timers" have forgotten most of its characteristics. Supermodulation is a form of grid modulation but don't let what they say in textbooks about grid modulation (critical adjustments, poor stability, low efficiency, etc.) worry you because none of these bugaboos are present in this system. However, some of its characteristics are present and must be observed.

First is the excitation requirement, which is approximately halfway between the minimum required for c.w. and the minimum required for conventional AM phone.

Second is the loading requirement in order to obtain upward modulation. L_5 must be proportioned and placed so that the antenna will fully load the final tank circuit. In both transmitters L_5 contains 4 turns of number 12 wire closewound and placed inside the d.c. end of the tank coil.

Now come the adjustments for proper modulation. Connect a dummy antenna for the initial adjustments, in accordance with FCC regulations. This may be two 200 watt lamps in series and paralleled by a 200 μμfd. variable condenser. Fire up the rig, set S_1 to C position and "juggle" the antenna coupling until approximately the following meter readings are obtained, with *no modulation*, always keeping C_{10} and C_{11} at resonance: PA grid—5 ma.; PA plate (J_1)—200 ma.; positive modulation plate (J_2)—30 ma.

With suitable audio or visual phone monitoring equipment set up, introduce modulation by whistling a steady tone, or by using an audio oscillator, and again go through the previous "juggling" procedure until good quality upward modulation is obtained at the 100% level. This is one system in which you can 100% modulate without splatter creeping in at the 85% point. Slight adjustments to the bias voltages may be found necessary but once set they will be permanent. Meter readings at *full* modulation should be approximately as follows: PA grid—2 ma.; PA plate (J_1)—140 ma.; positive modulation plate (J_2)—150 ma.

From the above it will be observed that during modulation approximately the following takes place on modulation peaks: PA grid decreases from 5 ma. to 2 ma.; PA plate decreases from 200 ma. to 140 ma.; positive modulation plate increases from 30 ma. to 150 ma.

With S_1 at position *B* the meter will indicate approximately 2 ma. in the positive modulation grid circuit on modulation peaks. An antenna current meter will indicate the customary 22½% increase in antenna current at 100% modulation.

In short, if you will spend a little time and energy building a supermodulated transmitter you will benefit by the following:

1. Reduce the power consumption from the a.c. mains by approximately 30%.
2. Practically eliminate BCI and TVI originating from audio.
3. Have better audio quality, all things being equal, because you will have no high-level audio transformer to add distortion to your signal.
4. Have a more easily copied phone signal because of the added "talk power" and the reduced heterodyne generating carrier in the crowded phone bands.
5. Have an extra measure of pride in your signal, realizing that you are making room in the band for more signals due to the inherent narrowness of your own signal.
6. Increase the power of your phone transmitter, with the same tubes, by approximately 30% and have practically none of your equipment standing idle if you want to work c.w.
7. Greatly increase the power, readability, and effectiveness of your NBFM transmitter with practically the same equipment now in the rig, if you are using push-pull tetrodes or pentodes in the final stage.

Go to it, fellow, it's not nearly as difficult or complicated as all these words make it sound.

The author wishes to express his thanks and appreciation to Mario Estrada (HK3ME) and Luis A. Rocha who did practically all of the actual construction work on the transmitter described herein. The author did little more than design the unit, give advice, and suggestions, and do the "heavy looking-on."

—30—

Fig. 5. Rear view of r.f. section showing shielded partitions.

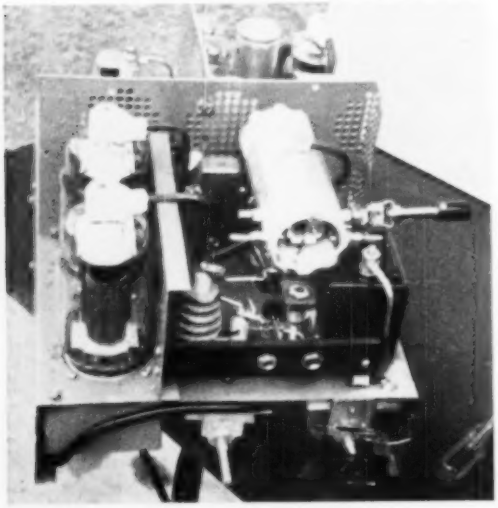
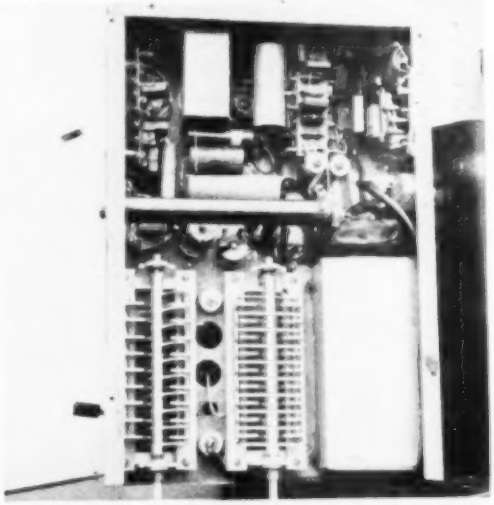


Fig. 6. Bottom view. Final condensers, C_{10} and C_{11}, are shown.



An Inexpensive GRID-DIP OSCILLATOR

By
WARREN R. YUENGER,
W0IOK
Dept. of Electrical Engineering
University of Denver

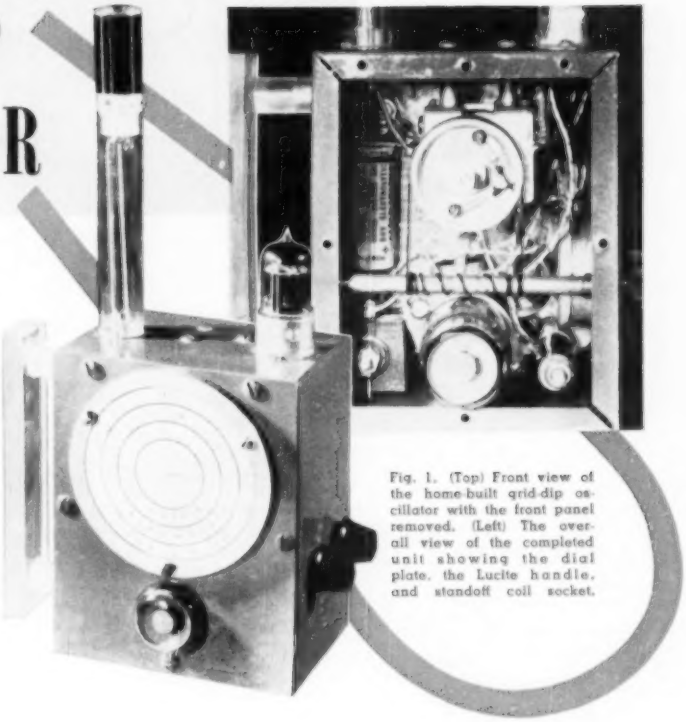


Fig. 1. (Top) Front view of the home-built grid-dip oscillator with the front panel removed. (Left) The overall view of the completed unit showing the dial plate, the Lucite handle, and standoff coil socket.

A stable, compact test unit for the ham that uses plug-in coils and a self-contained power supply.

ALTHOUGH inexpensive, accurate, and reliable instruments are available for the measurement of voltage, current, and resistance, no such devices have appeared commercially for the determination of inductance and the resonant frequency of an *LC* circuit. While bridge methods are ideal for the measurement of large inductances, the accurate measurement of small inductances such as used in communications equipment is difficult, because the stray inductances of the leads and bridge wiring may not be negligible compared to the inductance being measured. The effect of bridge conditions may be minimized by the substitution method, but the fact remains that the inductance bridge is relatively costly and finds its widest application in the laboratory.

Fortunately, another method is available. The series resonant frequency of an *LC* circuit is given by:

$$\frac{1}{2\pi\sqrt{LC}}$$

If the frequency and capacity are known, the inductance can be calculated. It has been found that a vacuum tube oscillator using *L* and *C* for frequency control will oscillate at a frequency which is very nearly the series resonant frequency of the *LC* circuit. It has also been established that maximum power transfer between two coupled *LC* circuits occurs when the circuits are resonant at the same frequency. If the *LC* circuit of a calibrated oscillator were coupled to a circuit whose resonant frequency was not known, this frequency could be determined by noting the frequency at which maximum power transfer occurred. This could be done by inserting an r.f. milliammeter in series with the circuit under test, but this method is neither convenient nor desirable, since the insertion of a meter might change the circuit capacity and therefore the resonant frequency. A better method takes note of conditions within the oscillator.

As external load is coupled to an oscillator, several reactions take place. The plate circuit impedance decreases, tending to raise the minimum plate voltage, which in turn causes the plate current to increase and the grid current to decrease. When the coefficient of coupling is less than critical, the maximum effect on the oscillator occurs at the resonant frequency of the external circuit.

Using this principle, the "grid-dip" meter has found considerable application among radio experimenters, with poor-to-excellent results. The author has sought to devise a grid-dip meter which would cover the entire range of communication frequencies, which would give uniformly excellent results, yet would be less expensive to duplicate than any similar device previously described in the literature. The instrument should be compact, self-contained, and convenient to operate.

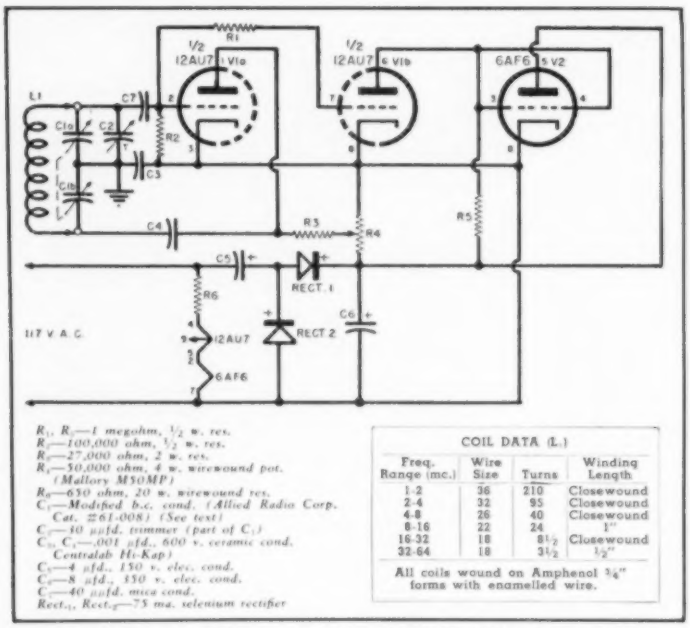
Design Considerations

Before proceeding with the design, a review of some of the limitations of grid-dip meters in general is in order.

1. Grid current, read on a milliammeter, varies with frequency from one arbitrary value to another.
2. Grid current may change erratically with frequency, giving spurious indications.
3. A separate power supply is required.
4. Plug-in coils are used.
5. The instrument is awkward to operate.

In the meter to be described, all objections except the use of plug-in coils have been eliminated. Although it would be desirable to use bandswitching, the mechanical and electrical design becomes difficult if the efficiency is to compare with plug-in coils.

As is well-known to most radio experimenters, the grid current of an oscillator is apt to vary with frequency, increasing with frequency in condenser-tuned circuits. In the Colpitts oscillator, Fig. 3, the ratio of r.f. grid voltage to plate voltage is determined by the ratio of C_g to C_p. If this ratio could be made to vary at the proper rate to compensate for the us-



R_1, R_2—1 megohm, ½ w. res.
R_3—100,000 ohm, ½ w. res.
R_4—27,000 ohm, 2 w. res.
R_5—50,000 ohm, 4 w. wirewound pot. (Mallory M50MP)
R_6—650 ohm, 20 w. wirewound res.
C_1—Modified b.c. cond. (Allied Radio Corp. Cat. #61-008) (See text)
C_2—30 μμfd. trimmer (part of C_1)
C_3, C_4—.001 μfd., 600 v. ceramic cond. Centralab Hi-Kap)
C_5—4 μfd., 150 v. elec. cond.
C_6—8 μfd., 150 v. elec. cond.
C_7—40 μμfd. mica cond.
Rect.$_1$, Rect.$_2$—75 ma. selenium rectifier

COIL DATA (L.)

Freq. Range (mc.)	Wire Size	Turns	Winding Length
1-2	36	210	Closewound
2-4	32	95	Closewound
4-8	26	40	Closewound
8-16	22	24	1"
16-32	18	8½	Closewound
32-64	18	3½	½"

All coils wound on Amphenol ¾" forms with enamelled wire.

Fig. 2. Complete circuit diagram, parts list, and coil data for the grid-dip oscillator.

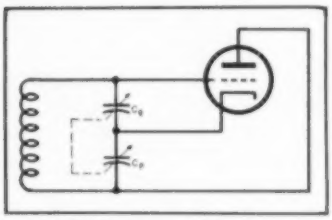


Fig. 3. Condenser-tuned Colpitts oscillator.

ual change in grid current with frequency, the grid current would remain constant. Experiment shows that, when the frequency range is not excessive, grid current can be stabilized satisfactorily by adding a fixed condenser in parallel with the grid section of the tuning condenser. With the proper choice of values, the variation of grid current can be made less than 10% over a 2-to-1 frequency range. Without compensation, the variation is from 35 to 45%.

Having assured a nearly constant grid current, the problem of visual indication next arises. The most obvious device is a grid milliammeter, which is ordinarily used in grid-dip meters. However, milliammeters are relatively expensive and bulky compared with the 6AF6 indicator tube, which consists of two independent sections, each requiring a d.c. amplifier. For our purposes, the two sections can be paralleled.

For compactness and electrical efficiency, the logical choice for the oscillator and d.c. amplifier is the 12AU7 medium-mu twin-triode. The use of selenium rectifiers in a voltage-doubler is the only possible alternative for the power supply.

Since individual tuning ranges of 2-to-1 allow coverage of 1 to 64 megacycles in only 6 ranges, as well as for convenience of dial calibration, this range was selected. It was found that a tuning condenser of 140 μμfd. per section permitted a slight overlap between ranges.

With a 6AF6 target voltage of 300 volts, approximately −15 volts is required at the grid of the d.c. amplifier to just close the "eye." Since the indication is the most sensitive at this position, the oscillator grid bias, which supplies the d.c. amplifier with control voltage, could not be allowed to exceed −15 volts and should be adjustable to exactly close the eye. With an oscillator plate supply of 300 volts, the grid bias will range from over −50 volts on the lowest frequency range to less than −15 volts on the highest range. It is necessary, therefore, to provide adjustment of the oscillator plate supply voltage. A potentiometer connected across the high voltage is the simplest and most effective method.

Since the grid-dip meter contains all of the essentials of an absorption frequency meter, it may be converted by removing the oscillator plate voltage. The eye is then normally open, closing at resonance with a source of r.f. energy.

To eliminate shock hazard, the cabinet should not be grounded directly to the negative high voltage, but should be placed at r.f. ground by a small bypass condenser.

Construction Details

After a "bread-board" model was tested, the actual work of construction was begun. The meter was to be compact without crowding of parts, so a standard 3" x 4" x 5" cabinet was chosen.

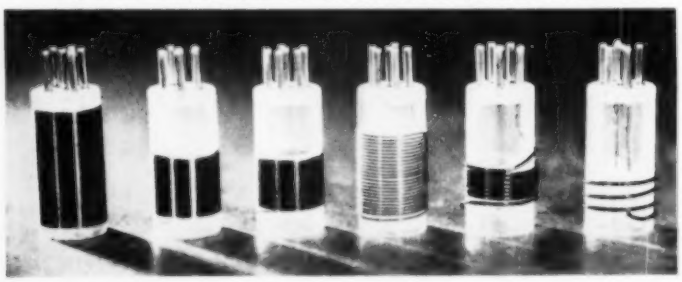
The largest single component is the tuning condenser. No miniature condenser which meets the electrical specifications was available, so a midget broadcast superhet condenser, rated at 420 μμfd. and 162 μμfd. per section, was modified by removing 6 rotor plates and the trimmers from the 420 μμfd. section.

The dial drive mechanism gives a reduction of 6-to-1. A 1½" drum on the tuning condenser shaft is linked with a ¼" drive shaft, which is a standard panel bearing assembly. Bearings are required at both ends, so the end opposite the tuning knob was drilled to engage a screw bearing inserted through the side of the cabinet. Details are shown in the photograph.

The dial plate consists of a 2¾" disc attached to a bushing which is secured by a set screw to the condenser shaft. Three ranges were calibrated on each half of the dial, the exact frequency being indicated by a vertical hairline on the Lucite dial cover. The dial markings were impressed photographically, although a paper dial marked in ink should prove satisfactory.

After the working model had been in use a few minutes, it became obvious that the handle is a more important part than it might at first seem. It must enable the meter to be held firmly in the left hand without turning. The original round metal handle was discarded in favor of Lucite, which is

Fig. 4. The set of plug-in coils used with the home-built grid-dip oscillator unit.



light, strong, and has a pleasant feel. A 5" x ¾" x ⅜" strip was cemented to two 1" long ½" diameter rods tapped for 8-32 screws which secure the handle from the inside of the cabinet.

The standoff coil socket mounting enables the instrument to be used in any accessible place. The 5-pin polystyrene coil socket was cemented in the top of a 4" length of ¾" o.d. polystyrene tubing, which is fastened to the top of the cabinet by means of a plastic disc cemented into the end of the tubing, tapped for mounting by a 8-32 screw, and drilled to pass the two leads from the coil socket.

The power supply components, consisting of the two electrolytic condensers, the selenium rectifiers, and the heater-voltage dropping resistor, are mounted on the rear panel, along with the 6AF6 socket.

Adjustments and Calibration

With the 4-8 megacycle coil in place, and the tuning condenser at maximum capacity, the oscillator plate voltage control is adjusted to exactly close the eye. With the tuning condenser at minimum capacity, the trimmer condenser is adjusted to exactly close the eye. This setting of the trimmer is permanent. Calibration can be accomplished by tuning in the signal from the meter on a communications receiver or by the use of an absorption frequency meter. Due to low circuit impedances, the eye does not entirely close on the 32-64 megacycle range. This does not impair the usefulness of the meter on this range however.

Operating Instructions

1. To find the resonant frequency of an *LC* circuit, place the meter coil a few inches from the circuit coil on the same axis. As the resonant frequency is approached, the eye will open, the amount of deflection depending on the "*Q*" of the circuit and the coupling.

2. To find the resonant frequency of an antenna connect a coupling coil of several turns across the transmission line or antenna terminals. This coil should be of larger diameter than the meter coil, so that the meter coil may be placed inside the coupling coil if necessary. The resonant frequency is found in the same manner as for an *LC* circuit. Note: Harmonics, as well as the fundamental frequency, will be indicated.

3. To find the inductance of a coil, connect a known condenser across the coil and measure the resonant frequency. The inductance can be calculated from reactance charts or the formula:

$$L = \frac{1}{39.6\, f^2 C}$$

where L is in microhenrys, f in megacycles and C in microfarads. For best results, the procedure should be repeated, using several different values of condenser.

In conclusion, the author wishes to acknowledge the invaluable assistance of James Takemoto, who designed and constructed the dial drive system. —30—

Mac's RADIO SERVICE SHOP

By JOHN T. FRYE

BARNEY IS "HOUSEBROKEN"

MAC had been awakened that hot and sticky July morning by the low rumble of distant thunder; but when he opened up his radio shop two hours later the storm still had not broken. Black clouds hovered over the town, and every few minutes the ground shook with the deep growl of the brooding storm, but no more than a few huge scattering drops of rain fell.

It was such a gloomy morning that Mac rather looked forward to the arrival of his red-headed, cheerful assistant, Barney; but when that worthy arrived, he looked even worse than the weather. His wide mouth was turned down like a croquet wicket, and his countenance was screwed up in a half-scowl that looked as out of place on his freckled face as a mustache on a kewpie doll.

"Greetings, Little Sunshine!" Mac saluted him. "Why the cheerful countenance and the general air of reckless gaiety you have about you this morning? Did Margie finally get smart and break the lease you seemed to have on her front porch swing?"

"Naw," Barney answered listlessly, "it's not that. I never have any trouble with my women. But I've just decided I'm a prize dope."

"You can't get an argument out of me on that subject," Mac said in cheerful agreement, "but what made you see the light?"

"Well, you know how I have been working on that tube tester idea of mine that uses a punched card shoved into a slot in the tester to set it up for a test. I have been going right along with the model. In fact, I worked until midnight last night putting on the finishing touches so I could bring it down and show it to you this morning. Then, before going to bed, I kicked on the ten meter rig to have just one QSO before hitting the sack.

"A PY down in Rio answered my CQ, and while we were chewing about this and that I mentioned that I was working on a new kind of tube checker. He came back and told me about a tube tester called the 'Cartomatic' made by the *Philips Company* that was very popular down there. It developed that this tester used a punched card that was shoved into a slot to set up the instrument for testing a particular tube! Can you beat it? All the time I was slaving away 'inventing' a tester, there was already one on the market."

"I was afraid of that," Mac told him consolingly; "but don't let it throw you. Since you had never heard of this *Philips* instrument, you really did 'invent' the tester. While you can't cash in on your brain child, no one can take away from you the really important thing: You did think up, all by yourself, a really good idea."

"Maybe you're right," Barney said more cheerfully. "I've got plenty on the ball; all I need is a little more speed."

"And to cheer you up further," Mac went on, "I have decided that it is about time you were housebroken."

"Housebroken!" Barney exclaimed. "Hey, what do you mean? I never—"

"I mean that you have worked in the shop long enough so that I feel you are ready to start making house calls."

"Fine!" Barney said with mounting enthusiasm. "I have been wanting to meet the public—and let the public meet me."

(*Continued on page* 115)

THE "SIGNAL SNATCHER"

By
LOUIS E. GARNER, JR.

A handy and easily-built gadget for television, AM-FM servicing, and general experimental work.

A SIMPLE yet effective piece of equipment that most service technicians will find valuable in their work is a handy little instrument known as a "Signal Snatcher." Although designed for use in servicing television receivers, this unit is equally useful in all servicing and experimental work.

It may be made simply by attaching a shielded lead to an ordinary .01 or .02 μfd., 600 volt paper condenser. Alligator clips are attached to the central conductor and to the shield of the lead.

If desired, a more professional instrument may be made by using a small condenser such as the *Solar* "Solite" and mounting it in a conventional test probe as shown in Fig. 1.

Essentially, the "Signal Snatcher" is used either as a signal tracer, "snatching" the signal from one section of the set and feeding it into another, or as a signal injector—again doing approximately the same job. The condenser is used only as a d.c. block, so that the probe may be used in plate and grid circuits without danger of shorting "B plus" or grid bias. The shielded lead prevents the feeding of the signal into other stages.

There are two basic ways in which the instrument may be connected to a television receiver. The most popular way is illustrated in Fig. 2. Here, the "Signal Snatcher" is used as a signal tracing probe for the TV receiver audio amplifier. The "hot" lead is connected to the high side of the volume control, and the shield connected to ground. When this connection is used, the first audio i.f. amplifier tube is removed.

In its other use, as a signal injector, the sound appearing in the plate circuit of the last audio amplifier tube is used as a test signal, and the instrument is connected as shown in Fig. 3.

Let's demonstrate the use of the "Signal Snatcher" in a typical TV receiver. A partial schematic diagram of the *RCA* 630TS television receiver is given in Fig. 4. The audio stages, video 2nd detector, video amplifier, d.c. restorer, sync circuits, and vertical deflection circuits are shown.

Suppose that the complaint is any one of the following: sound, no picture; sound, picture, but not synced; sound, but no vertical deflection; picture, no sound; no sound or picture, but raster; etc. The "Signal Snatcher" may be used to service a set with any of these complaints (and others). It is used to take a signal from any stage known to be working and injecting that signal, stage-by-stage, into the sections that are dead.

As an example, if there were no picture, the "hot" lead of the "Signal Snatcher" would be connected to the top of volume control R_{225}. The shield is connected to ground or set chassis, and the first audio i.f. amplifier tube (not shown) is removed.

Next, the probe is touched to the top of the video 2nd detector load, the junction of C_{180}, L_{170}, R_{130}, and L_{161}. If the characteristic video signal buzz is heard in the loudspeaker (you will soon get to recognize this signal), you know that the video i.f. and 2nd detector stages are operating properly. In making this test, we assume that sound is received, indicating that the front end and audio stages are operating, and that a station is on the air.

To check condenser C_{130}, simply transfer the probe to pin 1 of the 6AU6 1st video amplifier. Use the volume control to set the sound at a comfortable level.

The operation of the 1st video amplifier may now be checked by transferring the probe to pin 5 of this tube. The signal should be appreciably louder as heard in the loudspeaker. A check on coupling condenser C_{140} may be made by simply transferring the probe to pin 5 of the 6K6 2nd video amplifier.

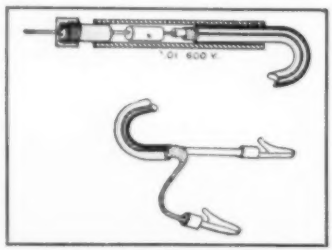
If a louder signal is heard when we transfer the probe to pin 3 of the 2nd video amplifier, we know that this stage is operating. The signal may even be checked directly at the grid of the picture tube by transferring the probe to the junction of C_{141}, R_{140} and the green lead from the 10BP4 tube socket. This is a check on the condition of C_{141}.

In this particular receiver, the sync pulses are taken from the d.c. restorer. Since this signal tracing technique may be used to follow the sync pulses as well as the video signal (a characteristic buzz being produced in the loudspeaker), we may now transfer the test probe to the junction of R_{146} and R_{156} (pin 2 of the d.c. restorer tube V_{311-B}). The sync pulse buzz should be heard in the loudspeaker. Next, the sync signal can be followed throughout the sync amplifier and separator stages by simply touching the probe, in order, to each of the following points: pin 4 of the 1st sync amplifier V_{310} (6SK7); pin 8 of V_{310}; pin 4 of sync separator V_{150} (6SH7); pin 8 of V_{150}; pin 1 of 2nd sync amplifier V_{320-A} (6SN7GT); pin 2 of V_{320-A}; junction of R_{320}, R_{321} and C_{150}; and, finally, junction of R_{160}, C_{320}, and the yellow lead from the vertical blocking oscillator transformer T_{300}.

By following the sync pulses through the sync amplifier and separator stages in this manner, an inoperative stage is instantly detected. But, in addition, the condition of the coupling condensers between stages is also indicated. As an example, if a strong buzz is heard when the probe is touched to pin 8 of V_{150} (6SH7), but little or no signal is heard when pin 1 of V_{320-A} is touched, we can be pretty sure that C_{150} is open.

The signal tracing procedure can now be followed through the vertical deflection circuit, thus checking the operation of this section of the set. The operation of the vertical oscillator V_{321} is checked by placing the probe on pin 5 of the 6K6GT vertical output tube V_{325}. If the low frequency vertical sweep signal is heard, the probe is transferred to pin 3 of V_{325}. A

Fig. 1. Assembly details of "Signal Snatcher."



stronger signal should be heard at this point. If not, we know that the 6K6GT stage has not amplified the signal.

The vertical output transformer and deflection yoke can be checked by transferring the probe to the junction of the green lead from vertical output transformer T_{oc} and the lead running to the vertical deflection coils in the yoke. If a signal is heard here, but no vertical deflection is obtained, the chances are that either the yoke or the centering control is open. A quick ohmmeter check will indicate which.

On the other hand, if no signal is heard when the secondary of the vertical output transformer is checked in this manner, but a signal was heard when the probe was touched to pin 3 of the 6K6, we know that the vertical output transformer is defective.

This signal tracing technique cannot generally be used in the horizontal deflection circuits of a TV receiver —simply because the audio amplifiers in most TV sets are not capable of effectively reproducing the high frequency (15,750 c.p.s.) horizontal sweep signal. Even if the system were capable of reproducing a signal at this frequency; many people are unable to hear signals at this high a pitch.

In addition to the general signal tracing procedure described, the "Signal Snatcher" may be used in several other ways. As an example, if a strong interference signal is received on a TV set, it is often worthwhile to be able to identify this signal, so that the length of the tuned stub or frequency of the wave trap employed for interference elimination may be determined.

Sometimes an interfering signal can be identified by using the "Signal Snatcher" to listen to the video signal at the video 2nd detector load. The leads are connected across the volume control in the usual manner and the probe touched to the "hot" side of the 2nd detector load resistor, just as at the start of the signal tracing test. If the interfering signal is exceptionally strong with respect to the video signal, it may be possible to identify it even when a TV station is being received. In most cases, however, the strong video signal buzz will drown out the audio signal from the interfering station, and it becomes necessary to check the interfering signal while the TV station is off the air.

Many TV stations, when transmitting a test pattern, also transmit an audio tone modulation on the sound channel at the same time. When this is the case, and in sets with a separate audio i.f. channel, the audio signal may be used for test purposes in cases where the complaint is "sound, raster, but no picture."

The "Signal Snatcher" is used for signal injection rather than for signal tracing purposes in this case and the 1st sound i.f. tube is left in place. The leads are connected as in Fig. 3. The audio signal appearing here is sufficient to drive the grid of the picture tube, and its level may be easily changed (when checking back from stage-to-stage) by adjusting the volume control.

Since a signal injection technique is to be employed, the probe is first touched to the grid of the picture tube. Characteristic horizontal "sound bars" will appear across the face of the CRT if this tube is in good condition, and if proper d.c. operating voltages and sweep voltages are applied.

If the sound bars are obtained, the probe is transferred next to the plate of the last video amplifier tube. If sound bars are again obtained, the probe is transferred to the grid of this stage. Then to the plate of the first video amplifier tube, next to its grid, and, finally, placed across the 2nd detector load. It is necessary to reduce the audio level (using the volume control) as the probe is transferred back from stage to stage in the video amplifier circuit to avoid overdriving the picture tube.

A similar technique may be employed where the complaint is "picture, no sound," but the video signal appearing at the plate of the video output tube is used for test purposes, and the probe used in the audio amplifier section.

Although the "Signal Snatcher" is extremely valuable as a servicing tool for signal tracing and signal injection, almost allowing a TV receiver to "service itself," its use is not limited to these applications. Often, a service technician will find it desirable to use a paper condenser in some particular application, either as a blocking condenser, or as a test bypass condenser. Here, the "Signal Snatcher" may again be used.

When using it as a test bypass condenser, for example, both of the test clips can be connected to the set chassis. The probe can then be touched to the "hot" side of suspected condensers, effectively shunting them. If oscillation or regeneration is cleared up as a particular bypass condenser is shunted with the "Signal Snatcher," you can be pretty sure that that condenser should be replaced.

Probably the only limits on the uses to which the "Signal Snatcher" may be put in servicing are the ingenuity and imagination of the technician using it. —30—

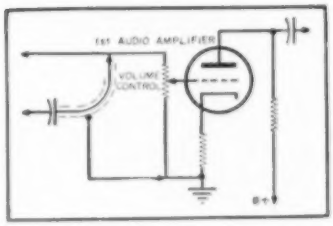


Fig. 2. Unit used as TV signal tracing probe.

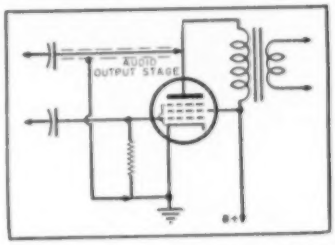


Fig. 3. The probe used as a signal injector.

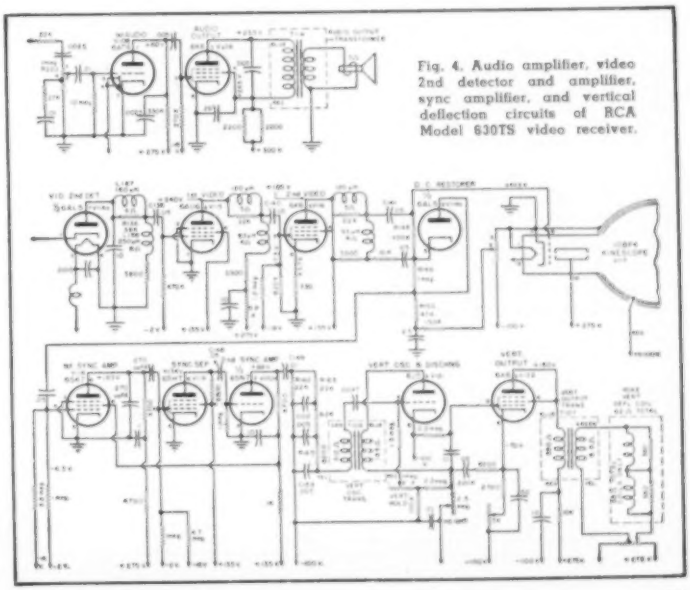
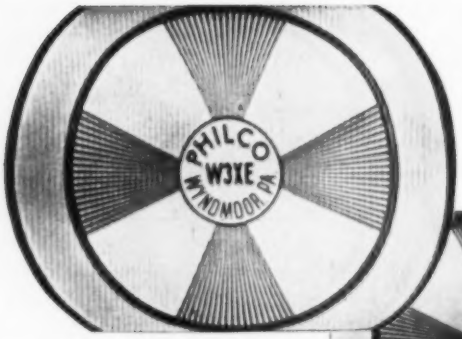
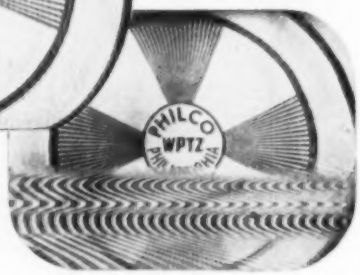


Fig. 4. Audio amplifier, video 2nd detector and amplifier, sync amplifier, and vertical deflection circuits of RCA Model 630TS video receiver.

TV INTERFERENCE PROBLEMS



Beat frequency interference as evidenced by fine vertical bars.



Diathermy interference indicated by familiar herringbone.

By DANIEL LERNER

TV Field Service Engr.
Philco Corporation

Methods for identifying and eliminating several common causes of television receiver interference.

WITH the recent increase in television receiver sensitivity, the problems of television interference have become more acute. In addition, the increase in the number of operating television stations is contributing new problems for the technician. Not only television stations but local short-wave, amateur, and FM broadcast stations as well as diathermy equipment may prove to be possible sources of interference to good reception.

Power line interference, due to any type of electrical equipment with breaking contacts on the line, can cause interference, which will appear on the screen as bursts of jagged white or black lines which may or may not cause the receiver to lose vertical synchronization. Equipment such as cash registers, electric shavers, and adding machines can cause this particular kind of interference. Isolating the trouble in this case becomes a matter of shutting off one piece of electrical equipment at a time until the offender is found. This type of interference may be minimized considerably by the use of power line filters, which usually take the form of low pass filters, that is, with the chokes as series elements and the condensers as parallel elements. In some cases merely putting a condenser of approximately .1 μfd capacity across the contacts of the offending equipment will cure the trouble.

Cases of interference caused by actual radiation from the discriminator section in a receiver are common. In most cases this type of radiation can be effectively combated by a careful redressing of the leads in this section, and in some cases by using grounded shields over the discriminator components.

Much more drastic methods involve actually detuning the sound i.f. of the offending sound section so that the radiation falls at a frequency outside the desired channel. For example, if the third harmonic of the i.f. falls at 66.2 mc. and causes a beat pattern on Channel 4, detuning the sound i.f. just .15 mc. will move the radiation away from this channel to 65.75 mc. This type of interference which causes a fine pattern to appear on the screen, can be easily isolated by removing the discriminator and sound i.f. tubes and noticing if the offending beat disappears. Video detectors, which are essentially non-linear devices, can produce harmonics which also cause interference patterns. Both detector and discriminator radiation effects are increased considerably when a built-in antenna is used. Also in fringe areas this radiation will be more apparent.

In some isolated cases, in installations close to high powered transmitters, interfering signals may be picked up by the receiver chassis or leads in the receiver. This effect can be minimized by using a bottom copper screen shield on the chassis and running a good ground to this screen. If this doesn't help, screening the entire inside of the receiver cabinet may be required.

Since either the fundamental or harmonics of the fundamental interfering frequency may cause trouble, there are numerous forms that this interference may take in the television receiver. Harmful effects may occur in the video or audio sections of any channel, and some method must be used in order to identify and track down the particular interfering signal or signals. The following methods are just a few means of tracking down interference:

1. If the interference is audible so that it interferes with the TV sound, the interference may be identified by hearing the call letters of the interfering station. If the interference is of an FM nature it will be amplified and detected in the sound system of the receiver. This does not mean that only a frequency modulated signal will cause interference for an amplitude modulated signal although limited to some degree by the first and second sound i.f. amplifiers, still has sidebands which can be considered as frequency changes. These changes are detected and, in turn, passed on to the sound amplifiers by the FM detector.

Sharp bursts of noise, such as ignition interference, although amplitude modulated in nature, contain a high amount of energy which lasts for very short periods. These noise pulses are not of one particular frequency, and are rich in harmonics. They cause the FM detector to reproduce short bursts of audio which are heard in the speaker.

2. If the interference appears on the

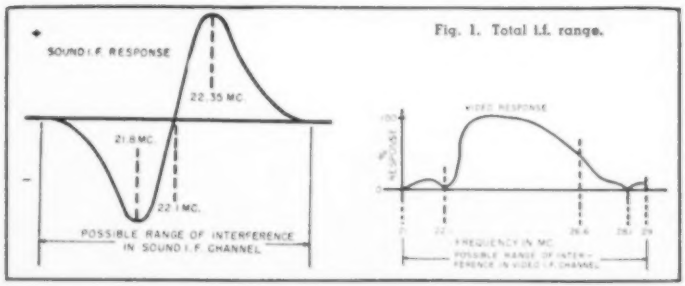


Fig. 1. Total i.f. range.

picture tube screen, the receiver local oscillator may be tuned lower in frequency so that the video i.f. signal is passed through the sound channel and may also be identified by listening to the station call letters. How easily the interfering signal can be heard will depend, to a great extent, on the strength of the signal since as the oscillator is detuned, the low frequency video and sync signals will be heard strongly in the speaker. An accurately calibrated signal generator may be used to provide a heterodyning signal so that an audible beat indication may be obtained, and the interfering frequency recorded from the generator frequency or log scale.

There are numerous ways in which interference occurs in television reception. A TV service technician should familiarize himself with the possible harmonic combinations of these interfering signals because this knowledge greatly simplifies the identification and subsequent removal of such interference. The principal possibilities of interference combinations are about eight in number. To make this explanation more simple, a specific channel (Channel 3) is chosen as an example, and the actual arithmetic involved in interference calculation is recorded. In these calculations a television receiver with a sound i.f. of 22.1 mc. and a picture i.f. of 26.6 mc. is used as an example. If a receiver with different i.f. is used, the figures for oscillator frequencies and harmonics must, naturally, be modified.

Channel 3 occupies the portion in the low TV band from 60-66 mc. Its video carrier occurs 1.25 mc. above the low limit of the frequency range or 61.25 mc. Its audio carrier occurs 5.75 mc. above the low limit of the frequency range or at 65.75 mc. Its oscillator frequency occurs 26.6 mc. above the video carrier or 87.85 mc.

The video i.f. response of the television receiver occurs in a range from approximately 22-29 mc., these figures being extreme ranges. In addition, the sound i.f. system will pass and amplify a signal of 21 mc., so that the interference limits in the television receiver can be said to occur from 21-29 mc. See Fig. 1.

A 28.1 mc. beat forms from the next lower channel's audio carrier, in this case Channel 2 (59.75 mc.), and the oscillator frequency of Channel 3 (87.85 mc.), but in the video i.f. section of the receiver a trap is tuned to 28.1 mc. and thus this possible interference frequency is eliminated.

1. Since the interference limits occur from 21 mc. to 29 mc., the radio frequency signal required to produce these beats is: $87.85 - 21.00 = 66.85$ mc. and $87.85 - 29.00 = 58.85$ mc. Thus any interfering signal in the band from 58.85 to 66.85 mc. will form a beat in the i.f. range (21 mc. to 29 mc.).

2. Any radio frequency signal whose second harmonic falls in the range of 58.85 to 66.85 mc., in this case 29.42 to 33.42 mc., will cause serious interference.

3. In case 2 the second harmonic was considered but harmonics up to the eighth harmonic should be considered where a strong local transmitter is operating. In this event 58.85 to 66.85 may be divided by any whole number up to eight to find the interfering frequency limits.

4. In the event of a strong local transmitter whose fundamental or harmonics fall in the range of 21 to 29 mc. (i.f. range), interference will occur.

5. Any radio frequency which is an image frequency, that is, the local oscillator frequency (87.85) plus the lower limit of the i.f. range (21 mc.), or the upper limit of the i.f. range (29 mc.) will cause interference. This interference will then occur from 108.85 to 116.85 mc.

6. Any radio frequency whose harmonic or harmonics fall in the image range (108.85 to 116.85 mc.) will cause interference.

7. Any radio frequency that is about 8.0 mc. above or below the oscillator frequency (87.85 mc.) in a range from 79.85 to 95.85 mc. will cause interference. This interference occurs because the undesired radio frequency signal will beat with the desired station carrier producing a beat within the limits of the i.f. range (21 mc. to 29 mc.).

8. Any radio frequency that is 21 to 29 mc. above or below the local oscillator second harmonic, 175.70 mc., will cause interference. This will occur from $175.7 + 21 = 196.7$ mc. to $175.7 + 29 = 204.7$ mc. or from 196.7 mc. to 204.7 mc. Also, it will occur from $175.7 - 29 = 146.7$ mc. to $175.7 - 21 = 154.7$ mc. or from 146.7 mc. to 154.7 mc.

The chart in Fig. 2 is tabulated for interference possibilities on Channel

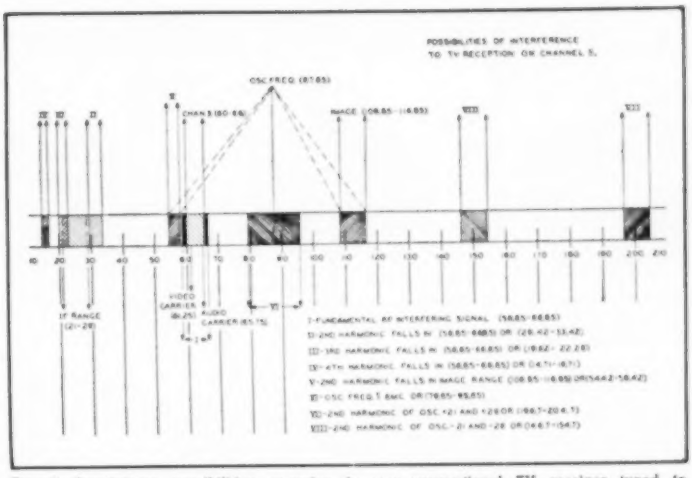
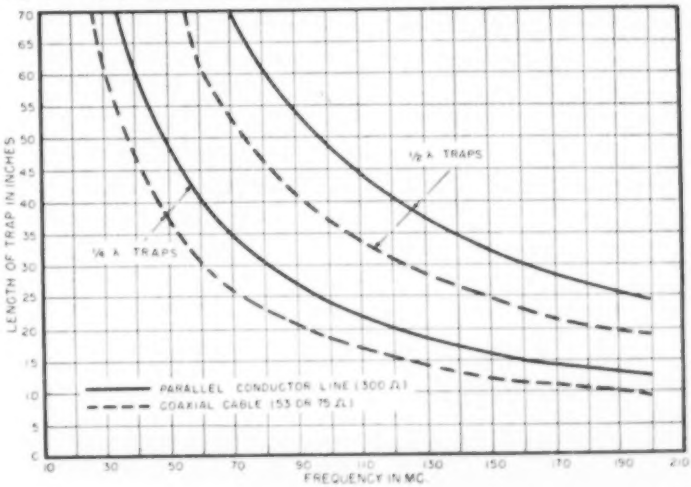


Fig. 2. Interference possibilities occurring in any conventional TV receiver tuned to Channel 3. Similar charts can be compiled for other channels, as explained in text.

Fig. 3. The graph which may be used to determine approximate length of a wave trap.



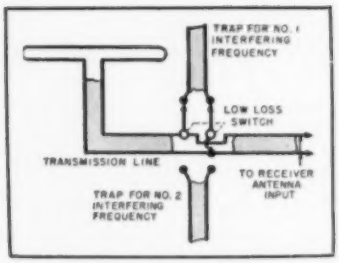


Fig. 4. Method used to switch wave traps.

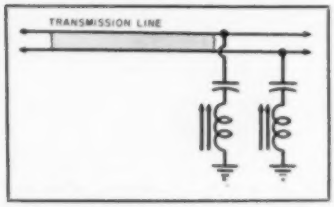


Fig. 5. Series traps for eliminating the interfering signals which fall in the sound and video i.f. frequency range.

3, but a similar chart can be made for any television channel by use of the mathematics and principles as outlined in the preceding discussion of Channel 3. If the video and audio carriers are known, the oscillator frequency can be found. With these three frequencies the chart can be made for any channel by using the examples for Channel 3 described in the preceding steps 1 to 8.

Eliminating Interference

In most cases, interference picked up by the antenna system can be greatly reduced or completely eliminated without seriously affecting the television signal. This may be accomplished by installing a wave trap across the antenna terminals of the receiver. The wave trap circuit should have an extremely low impedance to a signal of the interfering frequency and a high impedance to the frequency of the desired television signal. With such a circuit, the unwanted signal is effectively shorted across the line before it reaches the receiver, but the desired signal is practically unaffected by the presence of the wave trap circuit across the antenna.

A half wavelength of transmission line, shorted at one end, offers a low impedance at the other end to the frequency at which it is resonant. This half-wave section makes an effective wave trap. However, at the lower TV frequencies, a half wavelength of line may prove to be too long to be practical. In this case, a similar effect may be produced by using a quarter wavelength of line with open ends. The approximate length of the trap may be obtained from the graph given in Fig. 3.

It should be noted that with receivers using a common high and low band antenna input, and most receivers are of this type, the use of a trap across the antenna terminals becomes a problem in certain locations. In installations where the trap attenuates the desired signal on other channels besides doing its intended job, some sort of switching arrangement is required. Fig. 4 shows such a switch connected into the antenna input circuit. The switch used should be of a type having relatively low r.f. losses. A coaxial type switch is widely used and is recommended, but installations have worked properly with everything from a miniature to a large type knife switch. Of course, it should be noted that an antenna installation shouldn't resemble a power station!

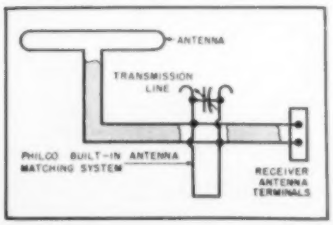
For interference at the sound or video i.f. frequencies, a series-resonant circuit of lump reactances is recommended for shorting out the unwanted signal. The "Q" of this series-resonant trap should be high so that only slight attenuation of the television signal is obtained. This trap is connected from each side of the line to ground. In many cases, however, one is sufficient. It is connected to the lead that runs closest to the r.f. grid. Actually this means the lead that is physically closer on the coil. It is suggested that these parts be mounted as close to the antenna input socket as possible. The diagram Fig. 5 shows such a trap arrangement.

Another method of minimizing interference is to tune the receiving transmission line, using the matching and tuning section from a *Philco* built-in antenna, as shown in Fig. 6. To accomplish this reduction of interference, the incoming transmission line from the antenna is attached to the matching section's principal inductive loop. The matching section can be mounted on or in the rear of the TV cabinet, keeping it away from any metal parts.

If the receiver is a *Philco* model containing the built-in aerial, then the two foil antenna sections mounted inside the cabinet are merely disconnected from the matching section. Then the matching section and the lead-in from the outdoor antenna are both connected to the antenna terminals of the receiver; and the effect is the same as described above and as shown in the alternate arrangement in Fig. 6.

Tuning the system for each channel not only reduces interference, but by matching the line and thus reducing standing waves, a greater signal is delivered to the receiver's antenna terminals. It should be noted that the system requires retuning whenever the channel selector switch is moved to another station. This matching system in most cases will not decrease the bandwidth of the system. Thus no harmful attenuation of useful picture or sound signal is encountered, and interference is reduced.

Fig. 6. How to use Philco's built-in antenna matching section to tune out interference.



To show typical problems that are found in the field and how they are solved, the following case histories are presented:

Case History No. 1 (Bound Brook, N. J.): Interference was reported by a customer in this city. The interference source was identified as a Government transmitter which operated at 21.6 and 21.7 megacycles. Since these frequencies fell within the limits of the audio i.f. bandpass of the television receiver, the interference blocked out the accompanying sound on all television channels.

In solving this problem two series traps were used, one placed from each side of the antenna-input terminals to ground. The traps used were of the type employed as accompanying-sound traps (22.1 mc.) in *Philco* receiver Model 49-1075. These traps were found to have broad enough tuning to provide adequate attenuation of both 21.6 mc. and 21.7 mc. In addition, a bottom chassis shield made of copper screen, grounded at several points to the chassis, was used to give further shielding and thus better protection against the interference.

Case History No. 2 (Detroit, Mich.): On a television receiver tuned to Channel 4, beat interference was reported at a customer's home. Upon investigation it was found that the second harmonic of the Channel 2 audio carrier (119.5 mc.) was beating with the Channel 4 oscillator (93.85) mc.), to form a beat frequency of 25.65 mc., which was in the video i.f. bandpass of the television receiver. The interference was serious only within a radius of approximately two miles from the Channel 2 transmitter.

To correct this condition a quarter-wave, open-ended stub made of 300-ohm transmission line and cut to resonate at 59.75 mc. (Channel 2 audio carrier) was attached to the antenna-input terminals. The stub was first cut to a length which was a few inches longer than a quarter wavelength. After the stub had been attached the line was shortened by clipping very short lengths from the open end of the line. The clippings were made small enough so that the point of resonance was slowly reached, and at each clipped point the quality of the signal, for both sound and picture, was noted. When the length producing best quality signals had been determined, another piece of 300-ohm line of the exact length was permanently installed. Other channels on the same band as that for which the stub was provided were checked for possible attenuation due to the presence of the stub.

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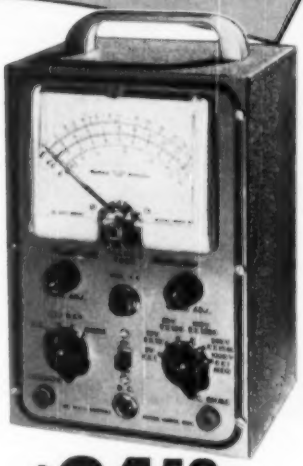

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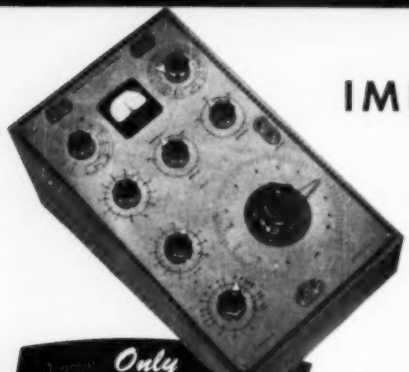

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Checks all types of condensers, paper-mica-electrolytic-ceramic over a range of .00001 MFD. to 1000 MFD. All on readable scales that are read direct from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarizing voltage for 20 to 500 volts provided. Measures power factor of electrolytics between 0% and 50%. 110V. 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instruction for assembly and use. Why guess at the quality and capacity of a condenser when you can know for less than a twenty dollar bill. Shipping weight, 7 lbs. Model C-2.

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Everything you want in a television alignment generator. A wide band sweep generator covering all TV frequencies 0 - 46 54 to 100 — 174 to 220 Megacycles, a marker indicator covering 19 to 42 Megacycles, AM modulation for RF alignment — variable calibrated sweep width 0 - 30 Mc. — mechanical driven inductive sweep. Husky 110V. 60 cycle power transformer operated — step type output attenuator with 10,000 to 1 range — high output on all ranges — band switching for each range — vernier driven main calibrated dial with over 45 inches of calibration — vernier driven calibrated indicator marker tuning. Large grey crackle cabinet 16⅛" x 10⅜" x 7-5/16". Phase control for single trace adjustment. Uses three high frequency triodes plus 5Y3 rectifier — split stator tuning condensers for greater efficiency and accuracy at high frequencies — this Heathkit is complete and adequate for every alignment need and is supplied with every part — cabinet — calibrated panel — all coils and condensers wound, calibrated and adjusted. Tubes, transformer, test leads — every part with instruction manual for assembly and use. Actually three instruments in one — TV sweep generator — TV AM generator and TV marker indicator.

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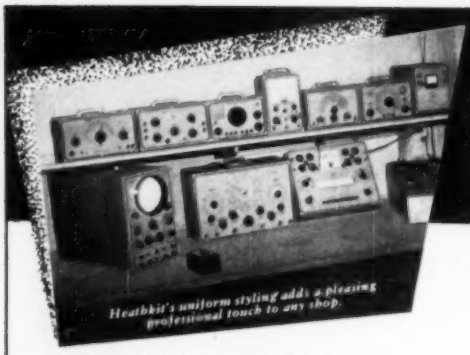

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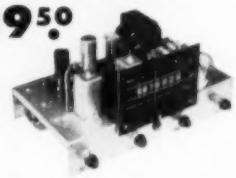

Ideal AC operated superheterodyne receiver for home use or replacement in console cabinet. Comes complete with attractive metal panel for cabinet mounting. Modern circuit uses 12K8 converter, 12SH7 input IF stage, 12C8 output IF stage and first audio 12A6 beam power output stage. 5Y3 rectifier. Excellent sensitivity for distant reception with selectivity which effectively separates adjacent stations.

The husky 110-V. cased power transformer is conservatively rated for long life.

The illuminated six inch slide rule dial is accurately calibrated for DX reception. Enjoy the pleasure of assembling your own fine home receiver. Has tone, volume, tuning and phono-radio controls. Chassis size 2½" x 7" x 12½". Comes complete with all parts including quality output transformer to 3-4 ohm voice coil, tubes, instruction manual, etc. (less speaker). Shipping Wt., 10 lbs. No. BR-1 Receiver $19.50.

No. 335 Communications Type Table Model Metal Cabinet **$4.50**
No. 320 High Quality 5" PM Speaker for above **2.75**

3 BAND MODEL AR-1
550 Kc. to 20 Mc.

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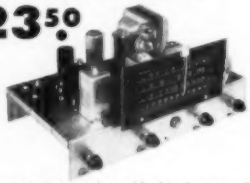

Enjoy the thrill of world wide short wave reception with this fine new AC operated Heathkit 3 band superheterodyne — amazing sensitivity 15 microvolt or better on all bands. Continuous coverage 550 Kc. to over 20 Mc. Easy to build with complete step-by-step instructions and pictorial diagram. Attractive accurately calibrated six inch slide rule dial for easy tuning. Six tubes with one dual purpose tube gives seven tube performance. Beam power output tube gives over 5 watts output.

Separately assembled coil turret with band switch eliminates difficult construction. Conservatively rated 110 V. power transformer supplies full operating voltages to all tubes for maximum reception. Has band switch, tuning, volume, tone and phono-radio controls. Chassis size 2¼" x 7" x 12½" — supplied complete — punched chassis — tubes — controls — transformers (quality output to 3-4 ohm voice coil) — all small parts — hardware and instructions (less speaker). Shipping Wt., 10 lbs. No. AR-1 Receiver $23.50.

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Ham TV Station

(*Continued from page 49*)

resistance. Alternatively, rods may be used for the reflector, spaced less than 1/10 wavelength apart. The length of the antenna is 13½ inches allowing for 1" space at center for feeding both halves of the dipole. The width of the reflector screen is 18". The length along the reflector from the vertex to the ends of the reflector is 36". The spacing of the antenna away from the corner depends upon the impedance of the cable used to feed the antenna. The spacing used for RG8/U was 14½". Higher-impedance cables will bring the antenna farther away from the corner. The enclosed angle between the corners of the reflector is 60°. Horizontal or vertical polarization of the antenna may be used (but be sure the same polarization is used at the receiving end, or very little signal will be obtained). A similar antenna is used for receiving. The same considerations as for building and siting the transmitting antenna apply equally well to the receiving antenna.

Receiver Converter

The diagram of the receiver converter is given in Fig. 9. The construction should follow the details shown in the photograph.

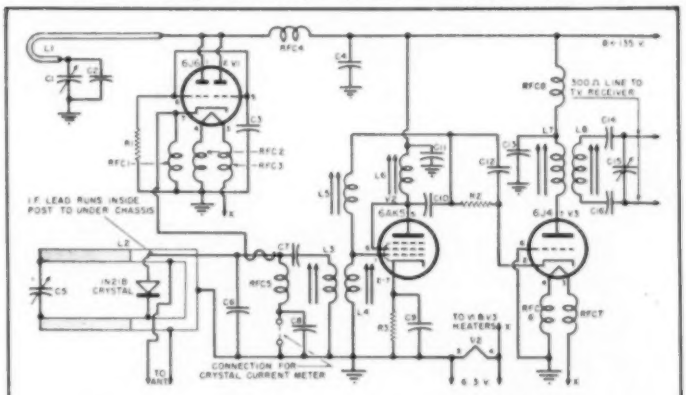
Miniature i.f. transformer cans and forms were used for the coils L_5-L_6, L_8, and L_9-L_{10}. The original forms in these cans were iron cored units measuring .280" diameter. Many of the small i.f. transformers are of these dimensions. In the event that such forms can not be obtained, the ¼" diameter iron core forms made by both *Millen* and *Cambridge Thermionic* should prove satisfactory. If these are used it may be necessary to add a turn or two to the coils specified to compensate for the reduced form diameter.

The tune-up of the converter is as follows.

The converter input circuit is *loosely* coupled to the transmitter output. Be careful not to couple too tightly to the transmitter as the mixer crystal might burn out. The converter mixer circuit may then be aligned by tuning the condenser C_5 across the ends of the lines, using a lucite or polystyrene screwdriver, until the crystal current, as read on a one ma meter, goes to maximum. The oscillator tube V_1 should be pulled out during this tuning up.

The converter is then connected to a television receiver. The local oscillator tube is reinserted. The television receiver is tuned, for example, to Channel three. The local oscillator tuning condenser C_1 of the converter is tuned until a signal is received on the television receiver. The transmitter is then shut off and the mixer crystal current from the local oscillator is read. The local oscillator coupling is obtained by a wire attached to the local oscillator cathode and wrapped around an insulated lead coming from the crystal to the i.f. input. This wrapping is ad-

Fig. 9. Schematic diagram of the receiver converter. A 6AK5 "cascode" amplifier is used, followed by a grounded-grid 6J4 used as the output amplifier stage.



R_1—2700 ohm, ½ w. res.
R_2—100 ohm, ½ w. res.
R_3—82 ohm, ½ w. res.
C_1—1-45 μμfd. midget var. cond.
C_2—10 μμfd., 500 v. silver mica cond.
C_3—15 μμfd., 500 v. ceramic cond.
C_4, C_6, C_{10}, C_{11}, C_{12}—.005 μfd., 500 v. ceramic cond.
C_5—1-7 μμfd. ceramic trimmer cond.
C_7—1 μμfd., 500 v. ceramic cond.
C_8—6.8 μμfd., 500 v. ceramic cond.
C_9, C_{13}—.002 μfd., 500 v. ceramic cond.
C_{14}, C_{16}—15 μμfd., 500 v. ceramic cond.
C_{15}—7-45 μμfd. ceramic trimmer cond.
L_1—2½" #14 bare in hairpin loop, ¼" wide
L_2—Two ⅝" wide brass straps, 5" long, 1" between centers, mounted on ⅝" square brass posts 1⅛" high. Crystal mounted by drilling through posts ⅞" from chassis. Hot lead from pin end of crystal runs through hole drilled length of post
L_3—10 t. #24 en. wound on .280" dia. form (see text)
L_4—8 t. #24 en. wound on .280" dia. form, spaced from L_3 by 1/32" (see text)
L_5—Approx. 22 t. #32 en. wound on ¼" dia. iron-cored form
L_6—6 t. #24 en. wound on .280" dia. form (see text)
L_7—10 t. #24 en., wound on .280" dia. form (see text)
L_8—10 t. #24 en. wound on .280" dia. form, spaced from L_7 by 1/32" (see text)
RFC_1, RFC_2, RFC_3—8" #26 wire airwound on ¼" dia. form, spread about ⅛"
RFC_4, RFC_5, RFC_6, RFC_7, RFC_8—48 t. #32 en. on .225" dia., 2 megohm res.

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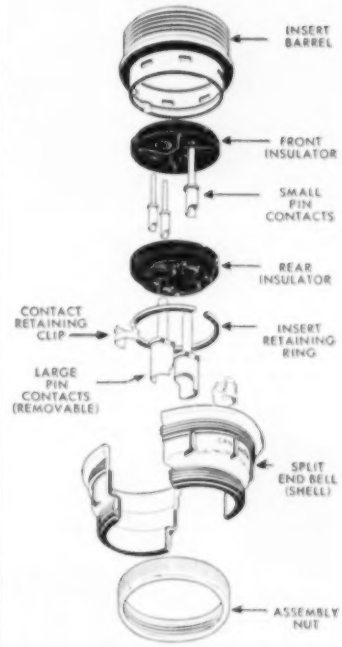

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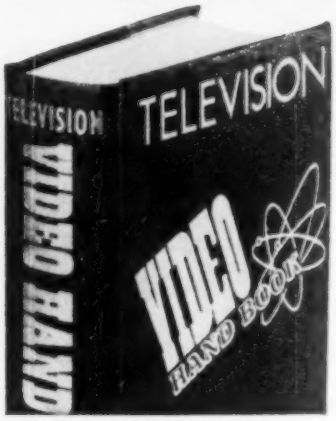

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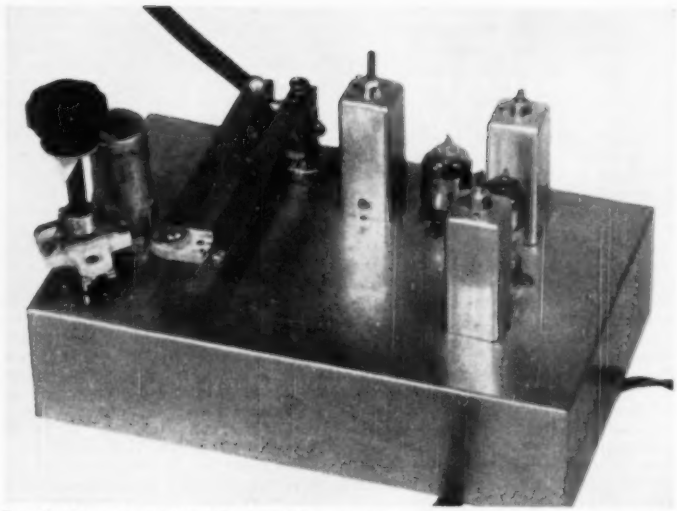


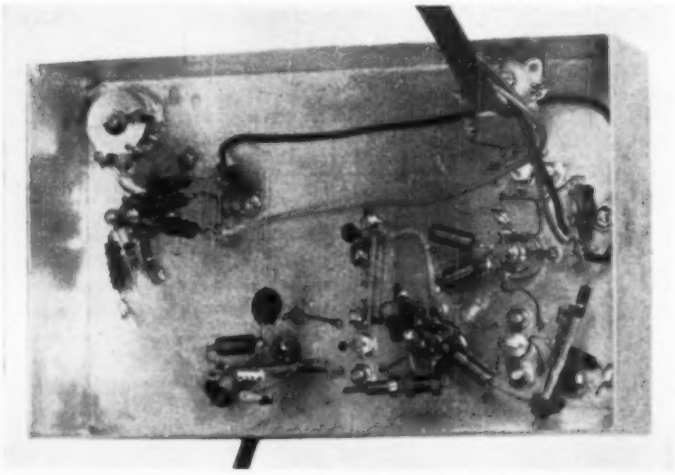
Fig. 10. Top view of the 420 megacycle converter for use with a standard TV receiver.

justed so that the crystal current in the mixer, due to the local oscillator signal, reads between .25 to 1 milliampere. If the meter is disconnected, connect a jumper in its place in the circuit. The "cascode" 6AK5 is neutralized by disconnecting its heater voltage and adjusting L_n, the neutralizer coil, until *minimum* output is obtained. The 6AK5 heater is then turned on again and the rest of the circuits are aligned in the same manner as for normal television i.f. circuits, with a signal generator or wobbulator. The variable condenser C_o in the converter output circuit, together with the iron slug in the output coil L_o, are adjusted simultaneously after the 300-ohm twin lead has been connected to the television set's input. The bandwidth of the converter i.f. is approximately 6 megacycles. Half of a 6J6 may be used instead of a 6J4.

It is realized that these notes can only help in a general way to get started. Since this system follows standard television procedures, the reader is advised to study the standard television textbooks such as: "Principles of Television Engineering" by Donald G. Fink (*McGraw-Hill*); "Television Simplified" by Milton S. Kiver (*Van Nostrand*); "Photofact Television Course" edited by B. V. K. French (*Howard W. Sams*); and "Television—How It Works" (*John F. Rider*).

Various ways not given here will naturally occur to the constructor in simplifying the processes involved. None of the circuit descriptions herein should be considered the only, or necessarily best, way of doing the job. —30—

Fig. 11. Bottom view of converter unit. Oscillator tuning condenser, C_t, is at upper left.



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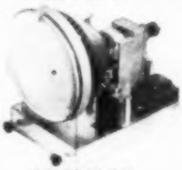

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A sensational new 1950 Model kit. Every part including a ready punched chassis, to build a television duplicator. (Sometimes called a slave or reproducer unit.) This kit has two definite uses. Build as a TV duplicator or build with the idea of later adding the video tuner stages, to use as an independent TV receiver. A real educational and useful item. After this kit is wired, you simply connect a standard 72 ohm coaxial cable to your present TV set. May be used on any size set; 7, 10, 12 or 16". Connect at the video detector and operate the remote unit up to 100 feet or more away from your TV set. Have a TV duplicator for your recreation room, etc. No special test equipment is needed to align this duplicator. It is in reality about ¾ of a TV set. You could order and build our LV-13 video tuner later on and have a complete TV set. This duplicator has its own controls and power supply circuit. Just hook to any PM speaker. Adjusting the brightness and contrast controls on master TV set does not affect the duplicator unit. We think this duplicator unit offers you a chance to experiment with TV and end up with a piece of equipment that you will benefit from. The complete kit of parts, less tubes and picture tube. Stock No. FG-19. Shipping weight 40 lbs. Net price **$29.95**.

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Diagram and photo furnished with the kit. Only those who have an understanding of radio and basic electronics should buy this kit. Chassis size: 15" wide, 17" long, 18" high with 12" tube and 20" high with 16" tube.

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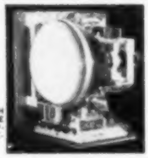

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12LP4 equivalent is furnished with neutral face at the scoop price of **$14.95**. Shipping weight 19 lbs.

All above tubes are not seconds and pass RMA standards. Guaranteed for 90 days to us. Name of famous maker has been withheld and does not appear on the tubes for obvious reasons. When ordering include ample postage.

SARKES-TARZAIN 13-CHANNEL T.V. FRONT END

WITH TUBES AND DIAGRAM $7.95

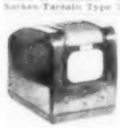
This popular Sarkes-Tarzain television front end is widely used to-day. The 13 channel rotary switch type with individually tuned coils. Price includes a schematic diagram and 3 tubes, 6C4 osc, 6BH6 RF and 6AG5 mixer. Regular factory cost is twice our price. Each tuner and its own tube sockets are wired, ready to hook up to a video and sound IF strip. May be used with either intercarrier or separate sound IF circuits. Built-in fine frequency control. Ship. weight 3 lbs. Sarkes-Tarzain Type 2 TV tuner with tubes net $7.95
Combination deal, Sarkes-Tarzain TV tuner and 205-XX video coil kit both for $14.95
Sarkes-Tarzain Type 3—Same as Type 2 only has input IF coil built-on. Tapped for sound IF channel. Net $9.95
Sarkes-Tarzain Type 3 tuner and 205-XX coil kit both for $16.95

TELEVISION VIDEO COIL KIT—20 MATCHED COILS FOR PICTURE AND SEPARATE SOUND I.F. $7.95

Order with a Sarkes-Tarzain Front End and Save

20 matched TV coils, video and sound I.F. McGee Scoop price **$7.95**. Television video coil kit, for TV sets up to 16", using separate sound and picture circuits. Consists of 20 coils for use in the nationally famous 30 tube and 22 tube TV circuit. All coils are of the finest construction, furnished to you, just like they go to a TV set maker. Each coil is identified. These are not made by RCA, but by a top quality coil company, especially for McGee. If you are going to use the RCA circuit, you can use this set of coils.

Coil kit has 1-180 uh, 1-250 uh, 2-120 uh, 2-93 uh peaking coils, 4 picture IF coils for 25.75 mc, 1 cathode trap, 2 sound IF's 21.25 mc, 1 discriminator, 1 converter and 5 filament chokes. Stock No. 205-XX, shipping weight 3 lbs. McGee's sale price **$7.95**. These coils match the Sarkes-Tarzain TV front end listed at left. Why not order both the tuner and the coils?



Buy this 10" streamlined mahogany television cabinet at ¼ actual cost of manufacturing. Originally intended for use in the Farnsworth factory. All brand new in factory cartons. Heavy construction with removable bottom base. Weight packed is 33 lbs. Size 13x19x17". Stock No. BY-10. Offered at the close out price of only **$2.95**. Buy both the BY-10 cabinet and the partially wired GVZ-60 Farnsworth TV chassis for only **$4.95**. This chassis has tube sockets, installed and over 100 parts, resistors, condensers, etc. However, no coils are included. BY-10 cabinet and GVZ-60 chassis. Shipping weight 40 lbs. Combination price **$4.95**. 1948 Supreme Television Manual, which includes a diagram of the GVZ-60, **$3.00** extra.

Regular $25.00 Television Magnifier

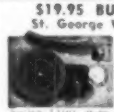
SALE PRICE $7.95

Stock No. HA-22

FOR 7-10-12 INCH TUBES

Stock No. HA-22 12x17 in. television magnifier. Made of crystal-clear plastic and oil-filled. Magnifies your present 7-, 10-, or 12-inch television picture up to four times. We offer you these new factory cartoned magnifiers, you provide your own means of mounting to your set. Edge of magnifier may be drilled and hung on your set with cord. This lens is a $25.00 value, but McGee offers them to you for only **$7.95**. Shipped by express only. Ship. wt. 22 lbs.

$19.95 BUYS A NEW St. George Wire Recording Mechanism ONLY 200 TO SELL



McGee offers you a terrific saving, the St. George Series 1100, wire recording mechanism. Brand new and factory cartoned. This unit will record and playback from a standard recording wire, up to 1 hour. The wire take-up reel turns at 78 RPM and will play and record from a 78 RPM phono record. The base is punched for a phono pickup. Space required, 9x13x3½". Shipped with a diagram of how to connect and also how to wire a 3 tube converter to enable the wire recorder to be used in conjunction with any radio or amplifier. St. George wire recording mechanism, Series 1100. Shipping weight 15 lbs. Net price **$19.95** each. Crystal phono pickup arm and cartridge **$1.95** extra. Recording wire: 15 minute spool. Net price **$1.19**. 30 minute spool. Net price **$1.79**. 1 hour spool. Net price **$2.79**. Crystal mike and desk stand **$4.95** extra.

Wire Recorder Converter FOR ANY WIRE RECORDER MECHANISM $12.95

Wire recorder converter **$12.95**. With this 3 tube converter you can adapt the St. George, Air King, or Webster Chicago wire recorder mechanism to any radio or amplifier. Only 3 connections necessary. Just plug in to the phono input of your amplifier and connect to plate of output tube. AC transformer construction, gain for mike, 3 position switch for quickly changing from record to playback. Priced ready wired and tested with instructions and tubes: 12AT7 preamplifier, 6J5 oscillator erase and 6X4. Stock No. RS-Y.

BUY YOUR RADIO KITS AT MCGEE FOR LESS

MODEL 6-ACX6
2 BAND CHASSIS KIT

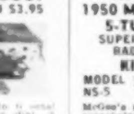
6 TUBE AC SUPERHET KIT BROADCAST AND SHORTWAVE MATCHED PARTS $11.95

A complete kit of parts, tubes and ready punched chassis to build a fine 6 tube, 2 band AC power transformer type radio chassis. (No cabinet.) We furnish all pieces as well as a printed diagram and photograph. Chassis size 14x7½x7". Receives standard broadcast and 6 to 18 MC shortwave. 3 gang tuning condenser used on both bands, on cell power transformer and 6V6 output tube. The chassis dial mechanism, gang and coils used in this kit were manufactured for use in a high quality Detrola radio. The heavy plate glass dial has etched-in numerals. This is a complete 2 band AC chassis kit, with tubes. The output transformer is furnished but the speaker is not. Use any standard PM speaker.
Stock No. 6-ACX6. Net price **$11.95**
10" Heavy duty PM speaker, **$3.95** extra
8" Heavy duty PM speaker, **$2.95** extra
12" Heavy duty PM speaker, **4.95** extra

2-BAND DETROLA—SCOOP COILS, GANG, DIAL, PAN $3.95

Genuine Detrola Chassis pan with 6 octal sockets. Heavy glass slide rule dial. 3 Gang Tuning condenser. All RF and IF coils and band switch for standard broadcast and foreign short wave. Buy these parts for less than the coil value alone. These parts all fit the chassis properly. Only material pictured and listed above is offered with diagram. It is not a complete kit. You supply your own tubes, speaker, resistors, condensers, etc. Stock No. DET-2. Shipping weight 9 lbs. Net **$3.95**.

NEW 1950 MODEL 5-TUBE SUPERHET RADIO KIT



MODEL NS-5 $9.95

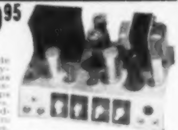
McGee's new 1950 Model 5 tube AC-DC superheterodyne radio kit. Has loop antenna and 2 gang condenser, with lighted slide rule dial and attractive plastic cabinet. Receives broadcast, 550 to 1650 kc. Full size dynamic speaker, matched 456 I.F.'s, automatic volume control. This is a complete radio kit. Everything furnished, including diagram, photos and tubes: 12BE6, 12BA6, 12AT6, 50B5 and 35W4. Shipping weight 7 lbs. Stock No. NS-5. Net price, **$9.95**.

McGEE RADIO COMPANY Prices F.O.B. K.C. Send 25% Deposit with Order, Balance Sent C.O.D. With Parcel Post Orders, Include Postage. TELEPHONE VICTOR 9045. WRITE FOR FLYER. 1422 GRAND AVE., KANSAS CITY, MISSOURI

WIDE RANGE AMP KITS COST LESS AT McGEE

34 WATT WIDE RANGE AMP KIT $29.95

- RESPONSE 20 TO 20,000 C.P.S.
- TWIN ELECTRONIC TONE CONTROLS



It's the newest thing in audio amplifiers. McGee's wide range, 34 watt amplifier kit with inputs for crystal or dynamic mikes and any crystal phono cartridge, as well as the new G.E. variable reluctance cartridge. Output transformer is wax impregnated, weighs 6 lbs. Voice coil taps 4-8-15-250 and 500 ohms. Push-pull 6L6 output tubes. Separate electronic base and treble boost. Inverse feedback. Input tube filament is DC heated to reduce hum level to nil. Frequency response from 20 to 20,000 cps. Easy to follow diagram and photos for easy assembly of this kit. Ready punched chassis. Every part furnished, including tubes: 2—6L6, 5V4, 3—12AX7. Shipping weight 25 lbs. Stock No. XX-34, net $29.95
XX-34 WT (wired and tested) $12.50 extra. Crystal mike and desk stand $4.95 extra.

NEW 15 WATT UTILITY AMP KIT

- INPUT FOR VARIABLE REL. PICK UP
- MIKE INPUT
- TONE CONTROL
- FADER CONTROL
- COMPLETE KIT

$12.95

Kit Model TM-15, push-pull wide-range 15 watt amplifier kit. Ideal for a high quality record player, as a P. A. system or recording amplifier. Matched component parts, ready punched chassis. One control fades from phono to mike. Input compensation for G.E. variable reluctance, pickup, fully shielded. Output matches 8 ohm voice coil. 100 mil power transformer. Complete with tubes, photos and diagram. 2—6V6, 2—12AX7 and rectifier. Variable tone control. Model TM-15. Weight 10 lbs. Net $12.95

MODEL ZZ-30—30-WATT $19.95

Commercial Quality Amp Kit
"Build an Amp Like You Would Buy"

A complete kit of parts to build a factory quality 30 watt public address amplifier. Servicemen, you can wire this amplifier and have a commercial looking unit. Pan and cover are ready punched and grey splatter finished. Size 5½x12". Inputs for two mikes and one phono. Base boost tone control. 4-8-16-250 and 500 ohm shielded output. With tubes: 2—12AX7, 6SN7, 2—6L6 and 5U4. Full size power transformer. All small parts furnished, nothing else to buy. Printed diagram furnished. Shipping weight 25 lbs. Stock No. ZZ-30. Net price $19.95
Wide range Capehart (regular $7.95) Output transformer $5.00 extra. Crystal mike and desk stand $4.95 extra.

New 1950 Music Lover—Radio, P.A.—Music System Kit

18 Watt Super High Fidelity Home Music System Amp. Kit. Resp. 20-20,000 CPS $19.95

5-Tube Self Powered AM Broadcast Tuner Kit $9.95

Buy Both Kits and Have a Fine Music System $28.95

This kit when wired will make a 20 to 20,000 CPS, wide range, all purpose 18 watt, music appreciation amplifier. Inputs for a radio tuner, crystal or dynamic mike and crystal phono pickup, also has preamplifier for G.E. variable Reluctance pickup. Nothing but the finest quality material is furnished with this kit. A heavy 200 mil power transformer, super wide range broadcast quality shielded output transformer, that may be connected to any 4 or 8 ohm PM speaker. Chassis size 9¼"x9½"x6" high. Tube line up is 3—7F7 and 2—7C5, plus rectifier. The circuit has very low resistance, well regulated power supply. Separate base and treble boost controls and fader circuit. Designed with controls on 30" shielded leads, so that you may install them on any panel and put the amplifier in a convenient location. Photos and schematic furnished with this kit, will build the finest all purpose amplifier we know of today. One well worth 3 times the kit cost. Super wide range amplifier kit complete with tubes (no speaker). Model S-2020. Shipping weight 16 lbs. Net price $19.95. Crystal mike and desk stand $4.95 extra. Why not order one of our wide range speakers with this kit, especially our P-15-8 or CU-13X

A self powered, 5 gang superhet tuner kit, with R.F. stage. When wired according to our diagram will make the best possible broadcast tuner (550 to 1650 KC), for use with any amplifier. Has a 6" lighted, slide rule dial. Don't class this with ordinary tuners, this has its own transformer. The complete kit is furnished with diagram and photo, with tubes: 6SK7 R.F., 6SA7 converter, 6SK7 I.F., 6H6 detector, 6X4 rectifier. Chassis size 9¼x8½x4¾" high. Shipping weight 8 lbs. Broadcast Tuner, Model BT-38. Net price $9.95

If you buy both the S-2020, 18 watt music appreciation amplifier kit and the BT-38 tuner, you can build yourself a fine custom radio-amplifier combination. Offered both for $28.95. Crystal mike and desk stand $4.95 extra. CU-13X, 12" coaxial PM speaker, $9.95 extra.

WESTERN ELECTRIC SPEAKERS

NOT SURPLUS
NEW 1950 SPEAKERS

Western Electric 728-B, 12" 30 watt, Alnico V high fidelity PM speaker. Increased production makes this speaker available now, at a new low price. Do not confuse this with surplus. It's brand new production. 12" Alnico V PM with a 4 ohm voice coil and treated cone. Response, 60 to 10,000 CPS. Shipping weight 18 lbs. Net price $31.20

Western Electric 755-A, 8" 8 watt Alnico V, high fidelity PM speaker. Response 70 to 13,000 CPS. 4 ohm voice coil. A very fine speaker. Shipping weight 6 lbs. Net price $22.35

SCOOP!

8" Speaker $2.95
8" Baffle $1.95

Stock SE-8X 8 inch heavy duty 6.8 oz. Alnico V PM with 1" 8 ohm voice coil, as illustrated. $2.95 each, 10 for $27.50.

Stock No. 8-BCM 8 inch tricolor, plastic front wall Baffle. Very popular with music box operators. Sale price $1.95 each, 10 for $17.50.

8 inch 6.8 oz. Alnico V PM speaker made by Jensen for Bell and Howell. A terrific bargain. Stock No. JEN-8. Net $2.95, 10 for $27.50.

McGee's Super High Fidelity

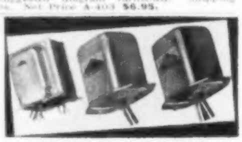
OUTPUT TRANS. 20-20,000 CPS. $6.95 *Best Value In U.S.A.*

Model A-403 High fidelity output transformer. Why pay $20 or $30 for an output, when our A-403 is available at $6.95? Impedance, 6600 ohms plate to plate, (for PP 6L6 or 6V6). 10% feedback winding. 4-8-15-250 and 500 ohm secondary. Housed in a potted case. Net weight 6 lbs. Recommended for all amplifiers up to 34 watts. Size 3¼x4½x3". Suggested diagram furnished. Shipping weight 8 lbs. Net Price A-403 $6.95.

BROADCAST QUALITY TRANSFORMER KIT

Response 18 to 22000 C.P.S. The Same Quality as Used in the Finest Quality Audio Amplifiers

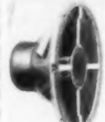
Why Pay More **Sale Price $12.95**



Here is the hottest transformer kit we have ever offered. Originally intended for use in the high priced Lear recorder amplifier. Made of the best possible material to give broadcast station frequency response: 18 to 22,000 CPS. A suggested diagram is furnished to build your own amplifier; with inputs for G.E. variable reluctance phono pickup, crystal phono pickup or radio tuner. Here are the transformer specifications: The output is a compound filled case, 3 x 2½ x 3½" high, weight 2¼ lbs., response 18 to 22,000 CPS, matches 2—6V6 in push-pull (15-watts), output taps match 4 or 8 ohm speaker. The power transformer is a fully shielded upright model, 3½ x 4½ x 4½" tall, weight 8¼ lbs. This transformer is utilized in a full wave selenium rectifier bridge, easy to hook up, full details included, which delivers 300 volts at 200 mils, with the best possible voltage regulation. Also has a 6.3 volt 5 amp. filament winding. The selenium rectifiers come with this kit. The choke weighs 2¼ lbs. and is the same size as the output. You get full description of the kit, including a suggested schematic. You supply the other parts. We furnish the power transformer, choke, output and rectifiers. Shipping weight 15 lbs.
Stock No. TD-1822. Net price $12.95

AMERICAS BEST VALUES IN WIDE RANGE PM SPEAKERS

"THEY WOOF AS THEY TWEET"



MODEL P15-8
15 INCH "COAXIAL" P.M. SPEAKER $19.95

- NEW 1950 MODEL
- REGULAR $62.50 LIST

"IT WOOFS AS IT TWEETS"

REPRODUCES ALL MUSIC AND SPEECH WITH NATURAL CLARITY
This 15", 35 watt peak coaxial PM speaker is not surplus. It is manufactured by a leading speaker company, to our own specifications. We buy them by the hundreds in order to offer them to you at this low $19.95 price. They are comparable to any $62.50 list speaker on the market. The 15" woofer will reproduce down to 20 cycles. It has a 22 oz. Alnico V magnet and molded cone with 1½" voice coil. The high frequency tweeter is coaxially built in, with a special cone that will produce notes up to 17,500 cycles. The input impedance of both reproducers combined, is 8 ohms. Matching network is concealed under the pot cover. Just hook this up like any other 8 ohm speaker and hear the difference. Shipping wt. 14 lbs.
Stock No. P15-8. Sale price, $19.95; 2 for $38.00

MODEL CU-13X
12 INCH "COAXIAL" P.M. SPEAKER $9.95

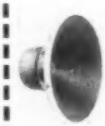
- New Aluminum Voice Coil Model
- Wide Range, 40 to 17,500 CPS.
- Reg. $32.50 List at McGee for

REPRODUCES ALL MUSIC AND SPEECH WITH NATURAL CLARITY
McGee announces its new 1950 Model 12" coaxial PM speaker. A regular $32.50 list speaker, but mass production enables a new low price of $9.95. Made especially for McGee by a famous speaker manufacturer, to our own specifications. It's a new 1950 model. The sale of 10,000 coaxial speakers assures you that this speaker is a smart choice. The speaker consists of a 12" Alnico V PM with coaxially suspended 3" hard cone tweeter. The 12" portion has a 6.8 oz. Alnico V magnet with 1" voice coil and heavy one piece ribbed cone. This responds to the lower register of the audio spectrum. The tweeter has its own separate 2.15 oz. Alnico V magnet. A high pass filter is concealed under the pot cover. This prevents low frequency from reaching the tweeter. The 3" tweeter has a very stiff cone and responds only to the upper register of the audio spectrum. With all this the speaker is still just as simple to connect as any ordinary PM. Only two wires to connect. Input impedance is 8 ohms. Designed especially for the critical music listener with a keen ear for the higher audio register. Response is from 40 to 17,000 cps. 18 watts. This speaker is ideal for the home music system. Generally used in only $400 to $800 radio installations. The high piano, cymbal and violin notes will reproduce clearly with our new 12" coaxial speaker. Model CU-13X. Shipping weight 8 lbs. Net price, $9.95; 2 for $19.00

MODEL 15-LS
15 INCH 40 WATT P.M. SPEAKER $15.95

- A Super Heavy Duty Deluxe P.M.
- 21.5 Oz. Alnico V Magnet

A regular $45.00 list 15" molded cone Alnico V PM speaker. 21½ oz. Alnico V magnet, with molded cone and 1½", 8 ohm voice coil. Truly a super heavy duty speaker that will take 35 watts with ease, up to a 50 watt peak. The King Juke PM. Response down to 20 cps and up to 12,000 cps. Shipping weight 14 lbs. Model 15-LS. Net price, $15.95; 2 for $30.00
Model 15-KR, standard juke box PM, 15" with 8 ohm voice coil and 12 oz. Alnico V magnet. Shipping weight 10 lbs. Net price, $9.95; 2 for $19.00



MODEL A-50
12 INCH 40 WATT P.M. SPEAKER $13.95

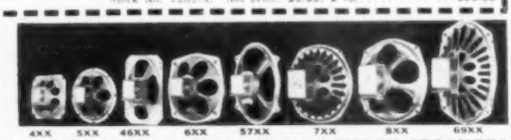
- FOR RUGGED P. A. USE

Model A-50, 12" 40 watt super heavy duty permanent magnet speaker. Has 1½", 8 ohm treated voice coil and one piece molded cone. Heavy half inch machined pot, with bolt secured 21 oz. Alnico V magnet. Frame is of heavy construction with metal pot cover. Finished in silver-grey enamel. This speaker is the best possible value today. Efficiency is two or three that of ordinary speaker. Especially recommended for all public address systems and high quality home audio systems. Will handle 35 watts with ease and 50 watts peak for short lengths of time. Its retail value is $50.00. Wt. 8 lbs. But, by our large purchase, we are able to offer it to you for only $13.95
TWO FOR $26.00

MODEL 1202-X
12 INCH WIDE RANGE P.M. SPEAKER $9.95

RESPONSE 35 TO 12,500 CPS.

Why pay more? McGee's new 1950 model 1202-X Music Lovers' Reproducer. A full heavy duty 14½ oz. Alnico magnet PM speaker. Full 1¼", 8 ohm voice coil. One piece molded curvelinear cone forms a trumpet for the high note distribution. An ideal speaker for high fidelity music system and P.A. work. The rugged construction of this speaker enables handling of low notes down to 35 cps; organ lows, etc. Highs up to 12,500 cps. Made for us by a famous speaker builder, to our own specifications. Lustre-grey finish, metal pot cover. Shipping weight 7 lbs.
Stock No. 1202-X. Net price, $9.95; 2 for $19.00



ALUMINUM VOICE COIL REPLACEMENT SPEAKERS

Radio Servicemen—These Are 1950 Production—in Cartons

Best Prices in America—ALUMINUM VOICE COIL SPEAKERS

McGee's Double X (XX) replacement speaker line is unconditionally guaranteed. All in individual cartons. Manufactured this year, by a renowned speaker builder, to our order. Newest Aluminum voice coil, Alnico V magnets, standard RMA 3.2 ohm voice coil. Why pay more? These speakers are second to none. We want your speaker business. We carry 50,000 speakers in stock, for you to pick from. Buy from McGee and save.

Double X Aluminum Voice Coil, Alnico V Magnet, RMA 3.2 ohm V.C.

Stock No.		Magnet	Each	10 for
4XX	4" square	1 Oz. Mag.	$1.09 ea.	10 for $10.00
5XX	5" round	1 Oz. Mag.	1.09 ea.	10 for 10.00
6XX	6" pincushion	1.47 Oz. Mag.	1.69 ea.	10 for 14.95
6XX2	6" pincushion	2.15 Oz. Mag.	1.95 ea.	10 for 17.95
46XX	4x6"	1 Oz. Mag.	1.49 ea.	10 for 13.95
57XX	5x7" oval	1.47 Oz. Mag.	1.95 ea.	10 for 17.95
7XX	7" pincushion (Auto set)	3.15 Oz. Mag.	2.79 ea.	10 for 24.95
8XX	8" pincushion	3.16 Oz. Mag.	2.95 ea.	10 for 27.95
69XX	6x9" oval	3.16 Oz. Mag.	2.95 ea.	10 for 27.95

Universal replacement output transformers for any push-pull or single plate 2500 to 13,000 ohms from 2 to 16 ohms voice coil. Standard size strap mounting with long leads and lugs for voice coil connections.

U- 5	5 watt universal output	$ .79 each	10 for $ 7.50
U- 8	8 watt universal output	.99 each	10 for 9.50
U-15	15 watt universal output	1.19 each	10 for 11.00
U-20	20 watt universal output	1.49 each	10 for 13.95

JJ-4 Single universal output. Any plate to 3.2 ohm voice coil. 4 watt, small size. 49c each, 10 for $4.50

McGEE RADIO COMPANY

Prices F.O.B. K.C. Send 25% Deposit with Order, Balance Sent C.O.D. With Parcel Post Orders, Include Postage

TELEPHONE VICTOR 9045. WRITE FOR FLYER
1422 GRAND AVE., KANSAS CITY, MISSOURI

BRAND NEW—OVER $80.00 LIST

MOTOROLA 8-TUBE

MODEL 708-T6

AUTO RADIO **$39.95**

With Speaker and Cables

Universal Under Dash Control $1.49 Extra
FITS MOST CARS AND TRUCKS
Push Pull 6K6 Audio 8-Watts Output

Priced less remote control. For all trucks and cars, order our 2A1 universal underdash control, or pick custom controls from our limited selection listed below. Of course you may buy a custom control from your Motorola jobber. World famous 8 tube Motorola auto set. Merchandised by Tucker but branded Motorola. A real distance getter with high fidelity audio. Tone control and push buttons. Fits most cars and trucks. Compact size, 9⅞x5¼x6⅞". **Everything furnished**, including 6" PM speaker, cables, hardware, etc. You furnish any push button custom control or buy our 2A1 universal underdash control at **$1.49** extra. Shipping weight 17 lbs. List price over **$80.00**. Motorola 708-T6 complete, less remote control. **Net $39.95**. 2A1 underdash remote control **$1.49** extra. (Will supply 7", 6x9", or 8" PM speaker in place of the 6" for **$1.49** extra.) Note: Pick a custom control from our limited list below for **$1.49** extra.

REG. $6.95 DCF-3 FENDER or COWL ANT. $2.49

Regular $6.95, 3 section top cowl or fender mounting antenna. 3 section 56"—only 31½ inches exposed when collapsed. A universal mounting design. May be ordered with your Motorola set or purchased extra for **$2.49**. Stock No. DCF-3. Weight 2 lbs. **$2.29** each in lots of 12.

10 Assorted Motorola Remote Control Heads $9.95

A RED HOT ITEM FOR THE AUTO RADIO SERVICE DEALER

10 assorted genuine Motorola remote control heads with knobs, pilot light, etc. 5 of each type, manual and automatic. Automatic heads: 42 Hudson, 46-47 Packard, 40 Hudson, 46-47 Hudson, 42-46 Cadillac, 42 Oldsmobile, 41 Nash, 41 Packard, 40 Pontiac, 40 Lincoln Zephyr, 40 Nash, 42-46 Lincoln Zephyr. Manual Heads: 42 Cadillac, 42 Hudson, 46-47 Hudson, 40 Nash, 42 Oldsmobile, 46 Packard, 42-46 Lincoln, 40 LaSalle, 42-46 Cadillac, 40 Hudson, 41 Lincoln Zephyr. **$1.49** each; 10 for **$9.95**.

1950 MODEL PORTABLE TAPE RECORDER

$99.50

Our brand new 1950 model portable tape recorder. Response, 60 to 8,000 CPS. With this you make and play-back top quality tape recordings. Tape speed, 7½ feet per second. New mechanism records 1 hour on 1200 ft. reel of tape. Fast rewind. Record 30 minutes, turn spool over and record second 30 minutes on 1200 ft. reel. Has an AC transformer type amplifier with 6" speaker. Inputs for mike and radio. External speaker jack. Price includes 30 minute reel of tape and mike. Hinged lid is removable. Case is attractive leatherette covered. Size 10x13x14". Shipping weight 29 lbs. **Stock No. PLT-3**. Net price **$99.50**. Extra reels of recording tape. Latest type recording tape, plastic with red oxide coating. 5" reel **$2.10** each. 7" reel **$3.30** each.
Latest type Kraft base, red oxide coating. 5" reel **$1.35** each. 7" reel **$2.10** each.

RADIO AND RECORD PLAYER $14.95

For your children's room. Buy this superhet radio and record player. Here is what you get: A full 5 tube superhet broadcast chassis all **wired** and tested. Walnut cabinet, 78 RPM phono motor and crystal pickup. All you do, when you receive your set is drill mounting holes in cabinet. We are offering you this radio-phonograph at the price of an ordinary record player. Shipping weight 15 lbs. **Stock No. JA-70**. Net price **$14.95**. **Stock No. AUT-JO**. Same radio chassis and cabinet as above, but furnished with a 78 RPM automatic record changer. Shipping weight 25 lbs. Net price **$24.95**.

Our Leader Changer Scoop $10.95, 2 for $20.90

Our leader, automatic changer scoop. Base size 13 x 13". Plays 10 12" or 12 10" 78 RPM records automatically. Has Astatic L-70 cartridge. Priced complete with a metal base, which can be used to slide away compartment or as a table top base, or changer can be lifted off base to fit your needs. Stock No. AD-12. Shpg. Wt. 17 lbs. Scoop price **$10.95** each; 2 for **$20.90**.

RECORD PLAYER KIT $9.95

Complete record player kit for 78 RPM records. All parts, tubes and diagram for building a 70L7 type amplifier. Attractive ready cut walnut base (speaker cut-out on top). Ballentine phono motor and Astatic pickup with permanent needle. Shipping weight 10 lbs. Model No. MD-18. Net price **$9.95**.
Three-speed model No. D-3378, same as above only has 3 speed motor and Webster flip-over pickup and twin needles. Net price **$14.95**.

50 PLASTIC 600 VOLT COND. $4.79

50 Molded Plastic By-Pass condensers. All 600 volt. All by the same factory. Not surplus. Regular dealers' net would be 2½ times our sale price. You will chuckle when you look these over.
5—.001 600 v., 5—.002 600 v., 10—.005 600 v., 10—.02 600 v., 5—.05 600 v. and 5—.1 600 v. Shpg. wt. 1 lb. Plastic 600 v. Deal No. 102. Net price **$4.79**.

SCOOP ON CARTRIDGES

Astatic N1-J Nylon 1 volt output cartridge with needle. Response to 8,000 cps. Net. **$2.79**.
MLP-1 Astatic cart. with needle. Net. **$1.19**.
Astatic L-72 or Webster equal, 3 volt output. Net **$1.79**.
Astatic L-70 or Webster equal, 1 volt output. Net **$1.79**.
Flip-over cart. with twin needles. Net $2.98.

3-SPEED AUTOMATIC PLAYER KIT

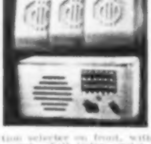
$39.95

Walnut cabinet automatic 3 speed record player kit. Attractive cabinet with hinged lid. Two tube amplifier kit of parts including diagram, tubes and Alnico V PM speaker. Latest 3 speed automatic record changer that intermixes records of the same speed, 33⅓, 78 and 45 RPM changer Model VM-400, with twin needles. A complete easy to assemble kit with instructions. Shipping weight 20 lbs. Stock No. LL-374. Net price **$39.95**.
Model LB-23 same as above only with 78 RPM changer. **$24.95**.

WEBSTER 356-1 $24.95

Brand new in original factory cartons. Only 50 to sell. Webster 3 speed automatic record changers with crystal cartridge and tandem tip permanent needle. Webster-Chicago Model 356-1. Shipping weight 16 lbs. Sale price **$24.95** each while 50 last.

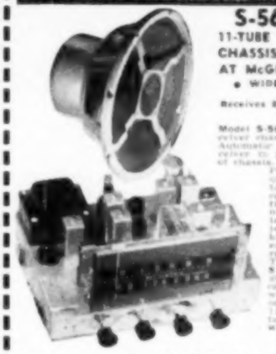
TERRIFIC INTERCOM SALE



10 STATION MASTER $19.95
SUBS, $3.95 EACH

Super heavy duty, 10 station intercom master, designed for continuous service. A powerful AC transformer type with 80 rectifier, 6V6 output and 6SJ7 driver. 5" speaker with 2.15 oz. Alnico V magnet. Housed in a walnut cabinet 14" long, 6½" deep and 7½" high. Designed to install as a 3 wire system. 10 push button station selector on front, with **separate all station call** switch. Talk-listen switch has silent position. Made to sell for a much higher price. McGee made a fortunate purchase and passes the bargain on to you. Shipping weight 12 lbs. **Stock No. 2520**. Net **$19.95** each. Remote station with call back switch for use with the above master. **$3.95** each; 10 for **$35.00**.

BUY YOUR S56 HALLICRAFTERS WITH A 15 INCH COAXIAL $77.95



S-56 HALLICRAFTERS

11-TUBE FM-AM CUSTOM CHASSIS. A $110.00 VALUE AT McGEE FOR ONLY . . . **$59.95**

• **WIDE RANGE** • **AUTOMATIC FREQUENCY CONTROL ON F.M.**

Receives 88 to 108 MC F.M. and Broadcast 550 to 1650 K.C.

Fine for Custom Installation

Model S-56 Hallicrafters, 11 tube AM-FM radio receiver chassis for broadcast and FM 88 to 108 mc. Automatic frequency control on FM, holds the receiver in perfect tune. Phono connection on rear of chassis. Full range **tone control** with bass boost. Push-pull 6K6 tubes in audio system. Frequency response essentially flat, from 50 to 14,000 CPS. Wide vision accurately calibrated slide rule dial, with pre-selection on broadcast band. Output transformer matches any 8 ohm speaker. 4 antenna terminals, two for AM and two for FM. This is the finest type of home radio that we know of today. **Better get your order in early.** Designed to be used in commercial radio selling in the **$400** to $600 class. The regular **dealers'** net on this chassis is $110.00. **However**, a lucky purchase enables us to offer these brand new, factory cartoned **S-56 Hallicrafters chassis**, complete with tubes and operating instructions, at only **$59.95** less speaker. Chassis size 12⅝x10x7⅛". Weight 25 lbs. Brand new factory cartoned. Buy your S-56 with a wide range PM **speaker**.

S-56 chassis with our **$62.50** list 15" coaxial (P15-8) PM speaker, on sale for **$77.95**.

S-56 chassis with our **$32.50** list 12" coaxial (CU-13X) PM speaker, both for **$69.50**.

S-56 chassis with our new 12" curvilinear cone (1202-X) PM speaker, both for **$67.95**.

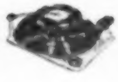
VM-950 Tri-O-Matic, 3 speed changer **$28.35**.

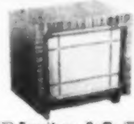
VM-950-GE, 3 speed changer with new GE RPX-050 V.R. cartridge **$31.20**.

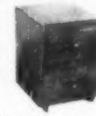
Pre-amplifier for S-56 $3.95

Dual purpose preamplifier **for either S-56. Only 4** wires to connect (instructions furnished). With this you can convert set to operate either a G.E. variable reluctance pick-up or a crystal or dynamic mike, making your S-56 a home P.A. system. Preamp Model SS-69. Size 3½x4x3". Shipping weight 2 lbs. Net price **$3.95**.
Crystal mike and desk stand **$4.95** extra.

BUY YOUR S-56 WITH A CHANGER AND CABINET







A **Arm Chair Cab. $29.95** B **VM-950 3-Speed $28.35** C **Furniture Baffle $29.95** D **Radio Changer Compartment $29.95**

A Armchair radio-phono combination cabinet. Specify when ordering whether you want the radio panel cut for the S-56 or blank. Size, 24" high, 27" long and 16½" wide. Will hold a changer up to 14" square. Changer panel is metal. For any speaker up to 12". Radio chassis area is 14" long, 9" high and 10" deep. Top quality furniture construction and finish. Walnut armchair cabinet, cut for S-56 or blank, net price **$29.95**. Mahogany armchair cabinet, cut for S-56 or blank, net price **$29.95**. Blond armchair cabinet, cut for S-56 or blank, net price **$34.95**. Shipping weight 40 lbs.

B The new VM model 950 Tri-O-Matic automatically plays all records, all sizes and all speeds now on the market. Protective features: records are lowered, not dropped, no wobbling down the spindle, no slip or scrape, no possibility of the tiny microgrooves in the new type records being damaged. Plays 12 10", 33⅓ or 78 RPM, 10 12", 33⅓ or 78 RPM, any 10 or 12" records of the same type intermixed, 12 7" 33⅓ RPM and 12 7" 45 RPM records. Automatically shuts off on the last record. Base size 13 13/16x12¼", 7¼" high overall. Equipped with crystal cartridge and needle. Stock No. VM-950. Shipping weight 12 lbs. Net price **$28.35**. New 1950 Model VM-950 with All-in-one General Electric Variable Reluctance Cartridge and Twin Needles. Specify VM-950-GE. Add **$2.85** to above cost.

C A fine furniture quality speaker baffle, made of ¾" brown mahogany. Will hold either a 12 or 15" speaker. (Specify size speaker you intend using when ordering.) You may buy this baffle by itself or for use with our radio and changer compartment. The two pieces are a matched pair. Set the radio cabinet by your chairside and the speaker baffle elsewhere. You may extend the speaker leads up to 50 feet on your S-56 or any other radio. This baffle is of high quality, non-rattle construction. Stock No. LS-4. Shipping weight 40 lbs. Net price **$29.95**.

D Radio chassis and changer compartment (no space for speaker). Intended for use with the speaker baffle on the left, or may be purchased separately if you have some place to put your speaker. Cabinet is made of ¾" brown mahogany and is of furniture quality. It is 25" high, 18¼x17¼". Consists of two drawers, one for the record changer 14¼x14¼x8¼ above the motor board; the other drawer has space for radio chassis up to 13" long, 9½" front to back and 8½" tall. We can supply with the radio panel cut for the S-56, the TB-22 utility chassis, or blank. Specify which when ordering. Stock No. TR-2. Shipping weight 38 lbs. Net price **$29.95**.

McGrade Intercoms

Master and Sub $14.95

McGrade Intercom. Master and sub-station housed in small matching walnut plastic cabinets. 5¼x7x5½ inches. Sloping front for desk or wall installations. Furnished with 50 feet of interconnecting wire. Sub-station may be used up to 1000 feet from master station. These units are new and factory cartoned. Complete with tubes. Made to retail at $29.95. A lucky purchase enables us to offer these to you for only **$14.95**. Include postage for 8 lbs. **Stock No. MB-35**.

6-TUBE—3 BAND RADIO

ANOTHER McGEE SCOOP

ONLY $15.95

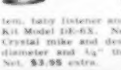
LIGHTED SLIDE RULE DIAL
BEAUTIFUL PLASTIC CABINET
FULL 2-GANG SUPERHET

Another red hot McGee special. We made a lucky purchase of 250 6 tube 3 band ac-dc 3 band radios. Attractive ivory plastic cabinet with lighted slide rule dial. Receives standard broadcast, foreign short wave and police. A full 6 tube 2 gang superhet with AVC. Made by a well known radio factory. Stock No. FR-63. Ship. weight 10 lbs. Sale price, **$15.95**, two for **$30.00**.

BOES MODEL 103 REG. $7.77 SIGNAL TRACER PROBE WHILE OUR STOCK LASTS

$2.95

Boes signal tracer probe, with instructions. Made to sell to you for $7.77. McGee's sale price only **$2.95**. You get this: a heavy bakelite probe containing a 6F5GT tube. (The end of the probe is secured by three screws and may be taken apart easily.) A 5 foot lead with 3 circuit amphenol plugs and receptacle and Mueller peewee clip. You can connect this probe to any AC amplifier and have a signal tracer or you may buy this just for the parts to build a HV multiplier or HF probe for VTVM use. Usable inside space for building purposes is 1¼ x 4". Overall length is 5". Price includes 6F5GT tube. A red hot special. Stock No. 103. Shipping weight 1 lb. Net, **$2.95**; 2 for **$4.95**.



Build Your Own Phono-Mike Oscillator

Kit Model DE-6X $6.95

Kit Model DE-6X. With this simple kit, you can build a 4 tube phono oscillator that also has a mike input. Will broadcast over any radio, within your home, (about 75 feet) from 800 to 1500 kc. Inputs for crystal mike or crystal phono pickup. Fader control fades from mike to record. Ideal for a home P.A. system, baby listener and home entertainment. A complete kit of parts including tubes. Kit Model DE-6X. Net price, **$6.95**. DE-6XWT, wired and tested. Net price, **$8.95**. Crystal mike and desk stand, **$4.95** extra. Concealed microphone unit, only 1" in diameter and ¼" thick. Specify hidden mike when ordering. Stock No. T-801. Net, **$3.95** extra.

McGEE RADIO COMPANY

Prices F.O.B. K.C. Send 25% Deposit with Order, Balance Sent C.O.D. With Parcel Post Orders, Include Postage

TELEPHONE VICTOR 9045. WRITE FOR FLYER
1422 GRAND AVE., KANSAS CITY, MISSOURI

What's New in Radio

For additional information on any of the items described herein, readers are asked to write direct to the manufacturer. By mentioning RADIO & TELEVISION NEWS, the page, and the issue number, delay will be avoided.

NEW HAM ANTENNA

The development of a new circular antenna for two meter ham operation has been announced by *Circle-X Antenna Corporation* of Perth Amboy, New Jersey.

Known as the "Circle X 2M," the new unit has a low standing wave ratio, a constant 300 ohm impedance, vertical polarization, and high loading qualities.

Priced in the moderate class, the new antenna is light weight, of simple construction, and easy to rotate.

UNIQUE TEST PROD

Of interest to television and radio technicians is the recently-announced "Klipzon" self-holding test prod being manufactured by *United Technical Laboratories*, Morristown, New Jersey.

The patented point on the prod has a jaw with an opposed steel needle which, when pressed against wire, lug, or terminal, slides on and grips it until pulled off. The slenderized design adds a minimum of capacity to high frequency circuits and facilitates contact with hard-to-reach points in the equipment under test.

The points fit pin jacks, tube sockets, and binding posts, and will grip all wires from the finest to #12 B & S gauge. Points are made of non-magnetic alloy steel and are needle sharp for ease in piercing insulation, wrappings, fungus, etc. Red and black Synthane handles provide good insulation against relatively high volt-

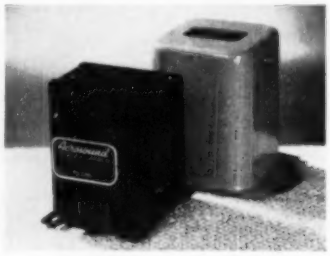
ages. Four foot red and black leads which will not curl or kink are supplied with the prod.

OUTPUT TRANSFORMERS

A new line of high fidelity output transformers is being introduced by *Acro Products Company* of 5328-30 Baltimore Avenue, Philadelphia 43, Pa., for use in original equipment or as replacement units.

The transformers are available in six models for the most popular tube combinations, including a special unit for use with triode-connected 807's as used in the Williamson circuit.

Frequency response is plus or minus one db. from 10 c.p.s. to 40,000 c.p.s. The units deliver full-rated power at 20 c.p.s. and will handle twice the nominal power rating over the useful audio spectrum. A newly designed symmetric



coil structure with accurate reactive balance, in conjunction with high permeability core material, is responsible for the extremely wide range response with negligible harmonic and intermodulation content at high power levels.

Full descriptive information and suggested circuit arrangements for high fidelity use are available from the company.

FM RELAY RECEIVER

Radio Engineering Laboratories, 36-40 37th Street, Long Island City, New York is in production on a new FM relay receiver, the Model 722, for the 88 to 108 mc. band.

The Model 722 is a rack mounted, single frequency, crystal-controlled double i.f. superheterodyne of excellent performance, distortion 50 to 15,000 cycles less than ½%; sensitivity noise factor better than 6 db., sputter point less than 2 microvolts, intelligibility with less than 1 microvolt.

The new receiver supersedes the company's *REL* 670 receiver.

"RECORD-LIFE"

The Chemical Division of *The Minnesota Electronics Corporation*, 97 East Fifth Street, St. Paul 1, Minnesota, has developed and is currently marketing a new liquid which is designed to prolong record life.

Tradenamed "Record-Life," the new product combines the functions of a cleaner and anti-static agent. The cleaning agent is formulated to disperse solids in the form of dust and to emulsify surface oils and greases that form mechanical bonds for dust and dirt. The new liquid contains no wax, alcohols, or other solvents and is free from hygroscopic agents and humectants which might leave sticky or hard deposits of solids in the high frequency grooves.

"Record-Life" may be applied to all types of records by means of a foam rubber sponge which is supplied with the liquid.

OSCILLOSYNCHROSCOPE

Designed to provide wide-band amplifier and versatile sweep facilities in a single portable unit, the new oscillosynchroscope announced by *Browning Laboratories, Inc.* of Winchester, Massachusetts, has been designated the Model ON-5.

The new unit is particularly well adapted to the study of pulse and transient phenomena as well as being useful in all conventional oscillographic applications. The vertical amplifier response is flat within 3 db. from 5 cycles to 5 megacycles. The horizontal amplifier is direct-coupled with the high frequency response extending to 500 kc.

The sweep generator may be triggered or recurrent with direct reading writing rate calibration for any internal sweep condition. Triggered sweep speeds from 1 microsecond per inch to 25,000 microseconds per inch and recurrent sweeps of 10 to 100 kc. are available.

An adjustable calibration voltage

may be used for determination of vertical deflection voltage amplitudes. Either d.c. or a.c. connection may be made to all deflection electrodes. Also provided is a panel connection to the cathode-ray tube cathode for external beam modulation.

GAMMA DETECTOR

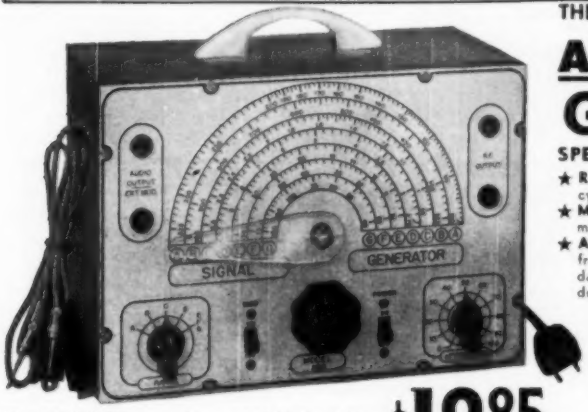
A miniature unit for the detection and measurement of gamma radiation has been announced by The Instrument Division, *The Kelley-Koett Mfg. Co.*, Covington, Ky.

(*Continued on page* 82)

GUARANTEE?
Every unit sold by us is covered by a one year guarantee.

MONEY BACK?
Every unit we advertise is offered on a strict "money-back-if-not-satisfied-basis." No if's—no but's—no maybe's. If you are not completely satisfied after a 10 day trial—return for complete refund. No explanation—you are the sole judge. Plain enough?

THE UNITS OFFERED ON THIS PAGE ARE COMPLETE INSTRUMENTS, NOT KITS! EVERY MODEL IS FACTORY-WIRED, CALIBRATED AND READY TO OPERATE.



THE NEW MODEL 200

AM and FM SIGNAL GENERATOR

SPECIFICATIONS

★ **R.F. FREQUENCY RANGES:** 100 Kilocycles to 150 Megacycles.

★ **MODULATING FREQUENCY:** 400 Cycles. May be used for modulating the R.F. signal. Also available separately.

★ **ATTENUATION:** The constant impedance attenuator is isolated from the oscillating circuit by the buffer tube. Output impedance of this model is only 100 ohms. This low impedance reduces losses in the output cable.

★ **OSCILLATORY CIRCUIT:** Hartley oscillator with cathode follower buffer tube. Frequency stability is assured by modulating the buffer tube.

★ **ACCURACY:** Use of High-Q permeability tuned coils adjusted against 1/10th of 1% standards assures an accuracy of 1% on all ranges from 100 Kilocycles to 10 Megacycles and an accuracy of 2% on the higher frequencies.

★ **TUBES USED:** 12AU7—One section is used as oscillator and the second is modulated cathode follower. T-2 is used as modulator. 6C4 is used as rectifier.

The Model 200 operates on 110 Volts A.C. Comes complete with output cable and operating instructions.

$18.85 NET

Superior's new model 770

AN ACCURATE POCKET-SIZE

VOLT-OHM MILLIAMMETER

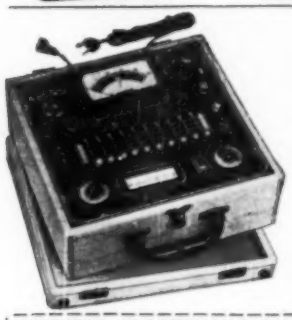
(SENSITIVITY: 1000 OHMS PER VOLT)

FEATURES: Compact—measures 3⅛" x 5⅞" x 2¼". Uses latest design 2% accurate 1 Mil. D'Arsonval type meter. Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. Housed in round-cornered, molded case. Beautiful black etched panel. Depressed letters filled with permanent white, insures long-life even with constant use.

SPECIFICATIONS: 6 A.C. VOLTAGE RANGES: 0—15/30/150/300/1500/3000 VOLTS. **6 D.C. VOLTAGE RANGES:** 0—7.5/15/75/150/750/1500 VOLTS. **4 D.C. CURRENT RANGES:** 0—1.5/15/150 MA. 0—1.5 AMPS. **2 RESISTANCE RANGES:** 0—500 OHMS 0—1 MEGOHM.

The Model 770 comes complete with self-contained batteries, test leads and all operating instructions.

$13.90 NET



SUPERIOR'S NEW MODEL TV-10

TUBE TESTER

SPECIFICATIONS

★ Tests all tubes including 4, 5, 6, 7, Octal, Lock-in, Peanut, Bantam, Hearing Aid, Thyratron, Miniatures, Sub-Miniatures, Novals, etc. Will also test Pilot Lights.

★ Tests by the well-established emission method for tube quality, directly read on the scale of the meter.

★ Tests for "shorts" and "leakages" up to 5 Megohms.

★ Uses the new self-cleaning Lever Action Switches for individual element testing. Because all elements are numbered according to pin-number in the RMA base numbering system, the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TV-10 as any of the pins may be placed in the neutral position when necessary.

★ The Model TV-10 does not use any combination type sockets. Instead individual sockets are used for each type of tube. Thus it is impossible to damage a tube by inserting it in the wrong socket.

★ Free-moving built-in roll chart provides complete data for all tubes.

★ Newly designed Line Voltage Control compensates for variation of any line voltage between 105 Volts and 130 Volts.

The Model TV-10 operates on 105-130 Volt 60 Cycles A.C. Comes housed in a beautiful hand-rubbed oak cabinet complete with portable cover.

$39.50 NET

GENERAL ELECTRONIC DISTRIBUTING CO. DEPT. RN-7, 98 PARK PLACE, NEW YORK 7, N. Y. RN-7

GENTLEMEN: PLEASE RUSH THE MATERIAL LISTED BELOW:

Quantity	MODEL	PRICE
	TOTAL	

Name _____

Address _____

City _____ Zone _____ State _____

$ _____ (Payment In Full Enclosed)

$ _____ (Deposit Enclosed—Ship Balance C.O.D.)

OLSON AKRAD

Olson Radio Warehouse, Inc.
73 E. Mill St. • Akron 8, Ohio

IT'S DIFFERENT—IT'S AMAZING—IT'S GREAT

IT'S NEW!

The OLSON LOUDMOUTH

RA-43 Complete with tubes and Electro-Voice Microphone. OLSON'S Special Price, only.....

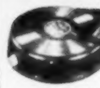
$29.99 EACH

A complete sound system • Inputs for both microphone and phonograph • Electro-Voice Microphone included • Underwriters Laboratories approved components

An entire sound system capable of delivering 6 watts (8 watts peak) at less than 5% harmonic distortion. Has input jacks for microphone and phono. Two controls, one for volume and one for tone. 8" heavy duty built in PM speaker, safety fused circuit. Hum free operation. Indicating pilot light. Suitable for use by musicians, singers, lecturers, lodges, clubs and any other entertainment application. The dual-channel input permits mixing of singing with the playing of phonograph. Frequency response, ± 2DB 100 to 8,000 cps. Power gain 105DB. Tubes 6SL7gt, 6V6gt and 6X5gt. Hum level 60DB below output level of 6 watts. Power consumption 30 watts at 117 volts, 60 cycles. Dimensions, 11¾x8½x13" high. Genuine leather carrying handle, beautiful two tone grey and blue carrying case with sloping control panel. Completely assembled ready to operate. Shpg. wt. 15 lbs.

Rim Drive Phono Motors

Famous Makes! Real bargains at these low prices. Self-starting: complete with turntable. All parts included Shpg. wt. 4 lbs. **OLSON'S SPECIAL.**
M-52, 78 rpm for 115 volts AC **$2.75**
M-63, 3-speed, 33⅓, 45 and 78 rpm **4.95**



Only **$7.95** Model 19

GE LONG-PLAY RECORD PLAYER

A close-out worth much more. Attractive streamlined cabinet contains quiet 33⅓ RPM motor, on-off switch and handsome pick-up with genuine GE variable reluctance phono cartridge and permanent needle. Brand new factory sealed cartons. Can be used on any set with pre-amp. Operates on 115 volts AC. Regular price $19.95. Shpg. wt. 5 lbs. **Special Price at OLSON'S.**

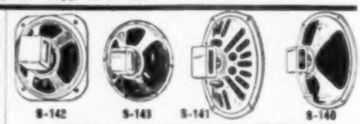
12" COAXIAL SPEAKER

12" SINGLE EACH **$9.95**

LOTS OF 2 EACH STOCK NO. S-122 **$9.50**

40 to 17,000 CPS response

If you've wanted a real high-fidelity coaxial speaker here is your chance to get a brand new 18 watt 1950 model. The 12" woofer section is driven by a heavy Alnico 5 6.8 oz. magnet and this part delivers the base notes. The 3" tweeter which is built into the center of the speaker is driven by a 2.15 oz. Alnico 5 magnet and delivers the treble notes. The high pass filter is built into the speaker and the entire combination gives you tone you never dreamed possible. There are only two wires to connect to any radio or amplifier and the speaker is ready to play for you. Voice coil impedance is 8 ohms. This high quality speaker should not be confused with inferior makeshift units. Olson sells these speakers on an iron clad money back guarantee if you are not 100% satisfied. Order today. Shpg. wt. 8 lbs. **OLSON'S BARGAIN.**

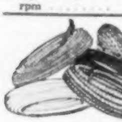


PRICES SLASHED ON GENUINE MAGNAVOX PM SPEAKERS

"The Oldest Name in Radio"

Latest designs to come from the Magnavox laboratory. Super Alnico 5 magnets employed. Voice coils built to utilize every bit of input power and to deliver volume and fidelity you never dreamed possible. Each speaker individually packed in an attractive carton. The name Magnavox on each speaker is your guarantee of the best. Voice coil impedance 3.2 ohms on all speakers except 12" which is 8 ohms.

Stock No.	Size	Watts	Olson's Price	
S-142	4"	3	$1.29	OLSON'S
S-143	5"	4	1.29	SPECIAL
S-141	6 x 9"	6	2.79	BARGAINS
S-140	12"	9	4.95	



HOOK-UP WIRE KIT

How can we give you so much high grade wire for so little? Olson bought all the wire in sight and is passing the bargain on to you. Kit contains 5 rolls, each 100 ft....total 500 ft. Various colors, push back, plastic and rubber insulation; solid and stranded copper. Shpg. wt. 3 lbs. **Special at OLSON'S**
AS-19, 500 feet **$2.50**

2 BAND RADIO CHASSIS

A 2-Band chassis which is partially assembled. Designed to be a 6-tube set but only 4 of the tubes are included: 1—12SQ7gt, 2—12SK7gt, 1—14Q7. The output and rectifier tubes are not included. Includes a 3-gang condenser, 3-section filter condenser, 6 sockets, 4 tubes, set of shielded RF, Antenna, Oscillator and 2 IF transformers, band switch, volume control, by-pass condensers, mica condensers, resistors and trimmer. Circuit diagrams are not available. Shpg. wt. 10 lbs.

$6.95 RA-49

ASTATIC MICROPHONE

Universal high output crystal for public address, home recording and communications. Equipped with handle and desk base, 7 ft. shielded cable. A beauty, too, for this price. Shpg. wt. 5 lbs.
M-67, each ..... **SPECIAL AT OLSON'S $4.95**

RADIO CHASSIS

79¢ each **X-228**

Real value for the experimenter. Each chassis contains at least 5 sockets, and one output transformer to match single tube to 3.2 ohm voice coil. Approximate dimensions 4 x 10 x 1½". Transformer alone is worth 79c, but Olson's price is **79c** for everything.

NEW INTERCOM

A real high quality Intercom ideal for home, office, nursery or sickroom. Quickly installed without tools. Remote stations may be placed as far away as 2,000 feet. Beautifully designed plastic cabinets with sloping front. Alnico 5 PM speakers deliver ample volume. Has on-off switch, push-to-talk switch and volume control. Master station uses 12SJ7, 50L6 and 35Z5 tubes. Size of cabinets 5½"x8½"x4". One or more substations may be used with the master station. **RA-40.** Master Station with tubes and 50 ft. of 2 conductor cable **$9.99**
RA-41 Substations, each **$3.99**

$9.99 RA-40 **OLSON'S BARGAIN**

MUSICAL INSTRUMENT MIKE

Famous quality! Sells for twice our sale price. Easily attached. Delivers brilliant tone from string instruments. With 4' shielded cable and volume control.
M-61—OLSON'S PRICE **$5.95**

CRYSTAL MIKE

Olson's Special **$4.49** **M-70**

Hand mike by a famous manufacturer. Beautiful Die Cast case. Equipped with 7' shielded cord. Frequency response 60-7,500 cps. Output —50 db.

Selenium Rectifiers

Individually boxed, brand new fresh stock. Useful for AC-DC sets, amplifiers and TV sets. Save and buy from OLSON.

Stock No.	MA	Lots of 10, each	Single each
X-184	75	$.59	$.69
X-150	100	.69	.79
X-185	150	.79	.89
X-186	250	1.19	1.29

Rectifiers may be assorted for 10 lot price.

By-Pass Condenser Kit

Assortment of 50 popular values, 200 to 1700 volts, capacities from .0002 to .25 mfd. Quantity limited. Shpg. wt. 2 lbs.
AS-35, ea. **OLSON'S BARGAIN** **$1.59**

KIT OF THREE VARIABLE CONDENSERS

A $3.50 value. Perfect for the experimenter. Brand new stock. Quantity limited.

Get a kit containing 3 assorted variable condensers. Popular values, 2-gang and 3-gang. Some have trimmers, vernier drives, AM and FM styles.

Olson's Price **$1.29** **X-220**, Carton of 3 asst.

MATCHED PAIR AM-FM CONDENSERS

Beautifully built! 3-gang. Build a tuner, or AM-FM set. AM sections are 365 MMFD; FM is 15 MMFD per section. Can be operated by push-buttons, too. Shaft ⅜" dia. Condenser 3"x1½"x4". Shpg. wt. 3 lbs.
X-201. Only at OLSON'S ..... **69¢** Pair

ASTATIC "TURNOVER" PICK-UP ARM

Cartridge turns by means of knob on front. One side plays 33⅓ and 45 RPM records and other side plays 78 RPM. Only 8 grams needle pressure. Employs the famous **ASTATIC** LQD-1 Double-needle cartridge. Die cast curved arm. Equipped with 2 long life needles. Frequency response 50-7000 cps output 1.2 volts. Shpg. wt. 2 lbs. Reg. list price $15.00. **Stock No. M-64, OLSON'S Price**, each **$4.95**

Genuine Astatic Pickup Arm

With crystal cartridge ... at less than you'd normally pay for the cartridge alone.
M-58 each **$2.19**

Cornell-Dubilier Condenser

Lots of 10, each **59c**

A truly universal condenser for practically any AC-DC radio. Make any combination from its 4 sections.
40—40—40—20 MFD—150 VOLTS
C-328, single, each **69c**

MICA CONDENSER KIT

Contains an assortment of 10 Mica condensers. Popular values. Priced at less than jobbers' cost. Shpg. wt. 1 lb.
SPECIAL AT OLSON'S AS-18, each **69¢**

FP CONDENSER KIT

Assortment of 15 popular FP condensers, double and triple sections. Capacities from 10 mfd to 80 mfd; from 25 to 450 volts. Shpg. wt. 3 lbs.
OLSON'S Bargain AS-24, each **$2.98**

PHONO AMPLIFIER

Easily connected to any phono and speaker ... or just the thing for a portable. Uses 1 each: 12SQ7, 50L6, 35Z5 tubes. 2 controls: on/off volume and tone. 7"x3¼"x2" chassis. Shpg. wt. 2 lbs.
At OLSON'S. RA-19 ..... **$2.98**
AS-22, tubes for above amp. **1.87**

3 SPEEDS FOR THE PRICE OF 1

Plays 78—45—33⅓ RPM Discs

Yes, you would expect to pay more for just a single speed player. But Olson made a quick cash deal with a manufacturer and we got 500 of these fine 3-speed record players. This is not a kit. Complete! Ready to play any size record up to 12" and any speed 78, 45, or 33⅓. Carrying case is sturdy, attractive leatherette covered with beautiful hardware and carrying handle. 3-speed motor made by Alliance, astatic tone arm has precious tip needle. Amplifier is scientifically designed. PM speaker is Alnico 5. Equipped with volume control and on-off switch. Operates on 115 volts AC. Shpg. wt. 15 lbs.
RA-34, Single, each ..... **$19.95** **Lots of 3, each $17.97**

4-DRAWER STEEL CABINET GIVEN WITH OLSON'S GIGANTIC, NEW AKRAD KIT

Olson's Price **AS-20** **$14.95**

You get $45.20 list worth of "Akrad" Condensers plus the 4 drawer steel cabinet **FREE**, size 8½"x7½"x10½". Shpg. wt. 11 lbs.

42 "Akrad" By-Pass Condensers!

Qty.	Cap.	Volts	List ea.	Total
2	.001	600	$.25	$.50
2	.002	600	.25	.50
2	.005	600	.25	.50
5	.01	600	.30	1.50
5	.02	600	.30	1.50
10	.05	600	.40	4.00
10	.1	600	.45	4.50
2	.008	1600	.55	1.10
2	.008	1600	.55	1.10
2	.01	1600	.60	1.20

Also 27 "Akrad" Electrolytic Condensers

Qty.	Cap.	Volts	List ea.	Total
2	10	25	$.75	$1.50
2	25	25	.85	1.70
5	20	150	.95	4.75
5	40	150	1.10	5.50
4	20-20	150	1.30	5.20
5	8	450	.95	4.75
4	16	450	1.35	5.40
69	**Value**			**$45.20**

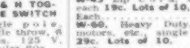
H & H TOGGLE SWITCH

X-158 **19c**

Single pole, single throw, 6 amps, 125 V. Regular 60c.

AC CORDS

Underwriters' Laboratory **approved**. Use in home and shop. Unbreakable plugs. Cord 6 feet long.
W-43 Zip Cord, single each **19c. Lots of 10**, Each ..... **14¢**
W-60, Heavy Duty, for motors, etc., single each **29c. Lots of 10**, each ..... **19¢**



MOLDED BY-PASS KIT

Kit contains 34 Olson Akrad molded condensers which retail at $12.80. Will resist heat, cold, vibration, humidity, physical shock, and electrical overloads. Each kit is packed in durable 6-compartment case with snap lock cover. Also included at no charge is a package of snappy tags to attach to radios which you service. Each kit contains the following:

Qnt.	Cap.	Volts	Qnt.	Cap.	Volts
2	.001	600	8	.05	600
2	.002	600	4	.1	600
2	.005	600	2	.005	1600
6	.01	600	2	.008	1600
6	.02	600	2	.01	1600

AS-34, OLSON'S PRICE **$4.95**

FREE SEND FOR OUR LATEST RADIO AND TELEVISION BARGAIN CATALOG

MONEY BACK GUARANTEE: Everything you order from Olson is guaranteed to be exactly as advertised by us. If, after goods arrive, you are not satisfied, you may return merchandise and get your money back.

Please Minimum Order $3.00

PRICE SLASHED ON LATEST 5-Tube, 12-Watt AMPLIFIER

Inputs for Crystal Mike, Variable Reluctance and Crystal Pickup. Olson's Great Bargain.

It's unbelievable, but Olson has done it again. A full 12 watt, beautifully built 5 tube amplifier which has inputs for crystal microphone, variable reluctance phono pickup and crystal phono pickup. In addition this amplifier is equipped with dual tone controls for treble and bass boost, equalized circuits and hum-free wide range response. Engineered by one of the foremost sound experts in the country and licensed by Western Electric. Guaranteed to satisfy.

OLSON'S BARGAIN PRICE

Power output—12 watts. Peak output—17 watts. Frequency response ±2DB, 40 to 15,000 CPS. Input—switch provides choice of conventional crystal pickup or G.E. Variable Reluctance. Also any crystal, dynamic or ribbon mike. Also any radio tuner. Controls—1 phono or Radio tuner; 1 Mike; 2 bass and treble tone controls. Tubes—2—6SL7gt, 2—6V6gt, 1—5Y3gt. Output impedances—4 and 8 ohms. Voltage—105-125 volts AC, 60 cy.

$27.95 RA-38 Complete with tubes

OLSON AKRAD

THE HOUSE OF RADIO AND TELEVISION BARGAINS

1000 RESISTOR KIT

Color Code Guide Included

Olson's Special Price **$15.95** Stock No. AS-29

A famous resistor manufacturer (you know who it is, too—called to tell us they had a terrific quantity of INSULATED resistors, all brand new—clean, fresh stock. We grabbed the whole works and Olson is passing the slashed price on to you. Every resistor is color coded and insulated. Guaranteed by the manufacturer and Olson. Included are ¼ and ½ watt values from 100 ohms to 10 megohms in popular ranges. Packed in a handsome steel 4-drawer chest with 48 compartments. Size 8¼x7½x11½". Here's your chance to get a full thousand Insulated Resistors at less than distributors' cost. Your cost is only about 11½c per resistor. Regular price is 6c each or $60.00. Shpg. wt. 12 lbs. Limit positively only ONE DEAL to a customer. None sold to Jobbers.

INSULATED RESISTOR KIT

OLSON'S Special Price AS-32 **$2.99**

Contains a carefully selected assortment of 100 Insulated resistors. Standard RMA color code. Included are 70—½ watt, 20—1 watt and 10—2 watt resistors. Handsomely packed in a durable pliofilm bag. Regular list price $15.80. Shpg. wt. 1 lb.

OLSON AKRAD CRYSTAL CARTRIDGES

XC-50. Standard Crystal Cartridge, single, each, **$1.79**. Lots of 10, each **$1.59**

XC-51. 3-Way cartridge with built-in 2 mil needle for 33⅓, 45, and 78 RPM. Each single, each, **$2.99**. Lots of 10, each **$2.39**

3-VOLT OUTPUT

This crystal phono cartridge you've been waiting for—and at a price which enables you to use them in your service work profitably. The new Olson Akrad cartridge is interchangeable with any standard cartridge since its mounting centers are ½". Its high output, 3 volts and wide range response of 50-8000 cps are obtained by advanced methods used in driving the crystal element. The cartridge is supplied with pin plug connectors for ease of connecting leads. Each cartridge is individually packed in a handsome red, white, and blue shelf carton. Olson Akrad cartridges may be assorted to get low 10-lot price.

GENUINE GENERAL ELECTRIC GERMANIUM CRYSTAL DIODES

Lots of 10 Choice any type **49c** Each

In the design of modern electronic equipment Germanium Diodes are becoming very important. Experimenters, servicemen and radio amateurs are now using these diodes to replace such tubes as 6H6 and 6AL5 as well as copper oxide, selenium and silicon rectifiers. Olson has just made a terrific purchase and you can buy them for a fraction of their regular price. Order by GE Type Number. May be assorted in quantities of 10.

GE Type Number	Sylvania Equiv. Type No.	Inverse Volts	Regular List Price
IN-51	IN-34	50	$1.35
IN-48	IN-34	85	1.60
IN-52		85	1.35
IN-63	IN-38	125	6.00

Type IN-48 and IN-51 Sylvania IN-34 is used for meter rectifiers, as in slide rule probes, noise limiters and in 1st and second detector circuits of FM and TV. Range up to 200 Mc. All above Germanium crystals can be used as highly sensitive crystals in crystal sets. Single unit, each, 59c

NEW DESIGN

World's Fastest Automatic Changer for RCA 45 R.P.M. Records

Price slashed by OLSON

$9.95 Each RA-45

Developed by RCA, built by Crescent, a famous name in the changer field. Plays 6 to 10 records—50 minutes of continuous music. Plays one side and 40 minutes with one turnover of the discs. New design does away with posts, clamps, which harm records. Discs slide easily over 1½" diameter spindle. Changes records in less than 2 seconds. Crystal cartridge has flat response from 50-10,000 cycles. Needle pressure is only 6 grams. Has built-in precious tipped 1 mil needle. Size 10¼x7½", height overall, 5¾", requires 3¼" above and 3¼" below base plate. For 105-125 volts AC. Shpg. wt. 8 lbs. Factory sealed cartons. **SPECIAL AT OLSON'S.**

RCA RADIO ELECTRIFIER

Converts Many Types of Portables to AC

Converts RCA Model 2BS6, 2BS72, etc. portable battery sets for operation on 115v AC. Plug in and set on electric. Adaptable to other portables. Complete with tubes. Shpg. wt. 2 lbs.

Olson's Price **$1.95** RA-19

RADIO TUBES

Individually tested GE, Ken-rad, Sylvania, etc. Quantities limited. Order early and get your pick. Order by Stock No. as well as Type No.

Stock No.	Type No.	Olson's Price
Z-6	1T4	29c
Z-8	3A4	29c
Z-29	5Y3gt	49c
Z-17	6BH6	29c
Z-33	6SH7	29c
Z-78	12AT7	49c
Z-13	12AU7	49c
Z-14	12BH7	69c
Z-15	12BY7	49c
Z-16	12SK7	69c
Z-17	12SQ7	49c
Z-23	35W4	49c
Z-25	35Z5gt	49c
Z-26	50L6	69c
Z-27	50C5	69c

PANEL LAMPS

Westinghouse GE, and Tung-Sol bayonet panel lamps. Brand new fresh stock. Packed 100 of a type to the box. Sorry, we can't split boxes at this low price.

OLSON'S SPECIAL BARGAIN

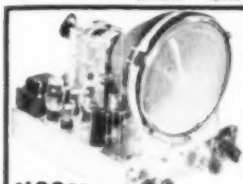
Stock No.	Type No.	Price per 100
X-181	47	
X-174	14	$4.90

CHANGE KITCHEN AIR IN 3 MINUTES

Powerful 8" exhaust fan designed to run day and night. Reversible—for exhaust or intake. Easily installed. Two adjustable sliding panels permit installation in standard window from 23 to 36 inches wide. Use it in kitchen by day to remove odors. Use it at night in bedroom to draw in cool air. Equipped with two-pole shaded induction motor, oil-less bearings. Operates on 115 volts 50-60 cycles. Consumes only 20 watts. Motor speed 2300 RPM. Motor is precision-made and is heavy gauge aluminum and the blades are aluminum and balanced. Has on-off switch and UL approved rubber cord, 6 ft. long with plug attached. Original factory-sealed cartons. Shpg. wt. 7 lbs.

RA-44 Olson's Special Price **$7.99**

OLSON TELEVISION SCOOP!



Never offered before—TV chassis with 12" tube! Not a kit—ready to use! Completely assembled!

$129.95 RA-33

Do you know a bargain when you see one? Look at this TV chassis . . . check over its features . . . then RUSH your sample order for just one set. You'll wonder how Olson could bring you such a terrific TV receiver at such a ridiculously low price. Every set is brand new and comes to you in original factory packing. Tube lineup: 3—6AG5; 2—6AU6; 2—6AL5; 1—6BG6G; 3—6SN7; 1—6AC7; 1—6J6; 1—6T8; 1—6V6; 1—6W4; 1—1B3G/8016; 1—5U4G. Set is prealigned and tested. All parts are the finest and the workmanship is really precision. PM speaker is furnished. There is absolutely nothing in the country to compare with this terrific Olson bargain in TV. Pictures are the steadiest, clearest and brightest you ever saw. You get superb performance even in fringe areas. Here's a TV set that defies comparison. Comes to you complete with all tubes including 12LP4 picture tube, speaker, knobs, cables and mounting template. Chassis size: 16" wide, 18" deep, 17" high. Operates on 115-v AC. Shpg. wt. 70 lbs.

16" Rectangular Tube TV Set

170 Sq. In. Picture

Not a Kit • Completely assembled with all tubes • OLSON'S Greatest Bargain, RA-50

$159.95

$159.95

ONLY AT OLSON'S

Made by a leading TV manufacturer who pioneered in TV development. Receiver is pre-aligned and tested at the factory. Only Olson's can bring you such a value. Contains 19 tubes in addition to the Kinescope picture tube. Equipped with standard coil tuner with 300 ohm inputs, acknowledged to be one of the finest tuners made. All condensers are latest 85° centigrade, insuring long life. Has built-in antenna which is suitable in all major signal areas. Power supply has fused primary and uses voltage doubler circuit producing 13,500 volts. Straight AC circuit. NOT AN AC-DC SET. Power supply equipped with safety cover. Deflection yoke is latest model 70° type. All tubes connected in parallel. All picture adjustments made from front of chassis. No fumbling in the rear to set up picture. PM speaker is supplied. Nothing in the country to compare with this great Olson value. Pictures are large, clear, sharp and steady. A fine set even in fringe areas. You can install this set in your own cabinet. Comes to you in factory sealed cartons including rectangular Kinescope tube, all tubes, speaker, knobs, cable and mounting template. Chassis size: 16" wide, 18" deep, 17" high. Operates on 115 volts AC. Shpg. wt. 75 lbs.

TV BOOSTER KIT

RA-26 **$9.95** Complete

Build your own TV-FM booster. Improves reception in low-signal, low-terrain and "fringe" areas. 3 to 5 db gain in signal to noise ratio. All channel tuning. Complete with 6AK5 tube, pre-aligned coils, components, instructions, etc. Shpg. wt. 2 lbs. **OLSON'S BARGAIN PRICE**

TV Focus Coil

T-80 **$1.49** Each

Same as RCA Part No. 202D1. Perfect for all RCA 630-type or similar TV sets. Regular list price is $7.50. Shpg. wt. 1 lb. **OLSON'S BARGAIN PRICE**

TV Deflection Yoke

T-84 **$2.95** Each

Same as RCA 201D1 for 12" or 10" picture tubes. Shpg. wt. 3 lbs.

TV FLYBACK TRANSFORMER

T-82 **$2.79** Each

Same as RCA 211T1. Supplies high voltage to 12" or 10" picture tube. Also has filament winding and feeds horizontal scanning coil of deflection yoke. Sh. wt. 3 lbs.

OLSON Hi-Gain Conical Bay

EACH **$4.49** AU-17

Amazing TV antenna outsells all others. Delivers high gain on all channels. Eliminates ghosts and has excellent signal to noise ratio. Features include silicone-treated insulator, narrow type dural elements, and bull seamed tubing. Assembled in a few minutes. Shipped without mast which is available locally. AU-17 includes universal mounting clamp for attaching to any mast from ¾" to 1¼" diameter. Special, price lots of 10, each, **$3.99**

Adjustable Chimney Antenna Mount

Worth Twice Our Price!

Strongly made of heavily plated steel. Makes it easy to attach any antenna mast from ¾" to 1¼" diameter to any chimney. Comes complete with U strapping and all hardware. U. S. Patent 2482375. The best. Shpg. wt. 2 lbs. Single each, $1.59. X-207, lots of 10 each **$1.39**

TV-FM Antennas

Olson's Finest TV-FM Antennas

$11.99 AU-65

Finest ever developed! Exceptionally high gain on all channels. Most efficient for "fringe" areas. Low standing wave ratio permits use with 72, 150 or 300 ohm lines. Special musical section design minimizes noises, reduces "ghosting"—results in sharp, clear picture. Easily assembled. Dipole has with 10 ft. mast. Shpg. wt. 10 lbs. AU-65 **$11.99**

Same antenna with single bay and 5 ft. mast. Shpg. wt. 10 lbs. AU-60 **$5.99**

HOW TO ORDER: Order directly from this ad. State quantity desired, stock number, description and price. You may send remittance with order include enough for postage on parcel post shipment, or, if you prefer, SEND NO MONEY. Olson will ship C.O.D. and you may pay mail or expressman for merchandise and postage.

OLSON RADIO WAREHOUSE, INC.
72 E. MILL ST. • DEPT. RN750 • AKRON 8, OHIO

MARS Station of the Month

MARS BEAMS WEEKLY BROADCASTS

MARS—Army Headquarters station, WAR, located at the Pentagon Building, Washington, D. C., broadcasts a weekly message each Tuesday at 0100Z and at 0400Z. (This is Monday at 8 p.m. and 11 p.m., Eastern Standard Time; Monday at 7 p.m. and 10 p.m., Central Standard Time; Monday at 6 p.m. and 9 p.m., Mountain Standard Time; and Monday at 5 p.m. and 8 p.m., Pacific Standard Time.)

Simultaneous broadcasts are made on frequencies 3497.5 kc., 6997.5 kc., 14,405 kc., and 20,994 kc. Each message is sent three times, once at 10 words per minute, once at 15 words per minute, and once at a higher rate of speed—usually 20 words per minute.

Designed especially to transmit quasi-official traffic and training information to MARS members, the broadcast offers an excellent opportunity to all amateurs in building up their code proficiency.

HEADQUARTERS U. S. Air Force has selected W2UMB-AF2UMB, operated by 1st Lt. Leo T. Meister, USAFR, of Hillside, New Jersey as "MARS Station of the Month" for his activities in Amateur and MARS affairs and for his further work in public relations.

Leo has worked closely with the Belleville, New Jersey, chapter of the American Red Cross offering the services of his amateur station and aiding in the organization of a mobile disaster communications service which he serves as vice-chairman. He also belongs to the ARRL-sponsored Amateur Emergency Corps.

In the recent Amboy, New Jersey disaster he responded to a call of the Newark, N. J. chapter of ARC and operated his mobile rig handling disaster traffic from 10 p.m. until 3 a.m. May 19 and 20, when he was advised the communications emergency was over.

Leo works 40 and 80 meters from his car as well as MARS frequencies and the 35 minutes it takes him to commute from home to work is spent regularly in local rag chews, with upstate New York being considered as "local DX." Noon hour usually comprises of a junior size ham fest at the *Walter Kidde* plant where Leo works as an industrial engineer. Leo drives W2UMB mobile to a choice clear spot near the guard shack at the *Kidde* plant where all the hams at the plant take turns at the mike for mid-day skeds. This activity has interested a large number of non-amateur *Kidde* employees, many of whom have pursued this interest to the point of obtaining an amateur license.

At home Leo operates on the MARS frequencies on a long wire and on 10 meters using a vertical dipole in the attic. TVI is escaped by working 10 meters early mornings and the 80 meter MARS frequencies at night. One prize item of "home equipment" is young squirtess Helene Donna who serves as a perfect monitor. Brat like, she's up before the rest of the family and if any hot sigs are on the band she zeroes them with the v.f.o. and screams for the Old Man to get out of the sack and flip the transmitter switch for her.

Incidentially Helene has been an avid knob twister since her second birthday and Leo is teaching her the code along with her ABC's. At the rate she has been learning Helene promises to set a record for the youngest ham. She carries on a very good QSO especially if the chap on the other end is interested in dolls and what happened yesterday at kindergarten. When things are a bit dull on the band and Leo's basso profundo doesn't raise any one on a CQ Helene's cheery little peep always does the job. To make it unanimous the XYL is an enthusiast, too, and will be ready to take her ticket exam, soon.

The home installation consists of a *Meck* T-60 transmitter with a *Meissner* Signal Shifter ahead of it to operate on 10, 80 and MARS frequencies. The receiver is an SX-42. The mobile installation is a transmitter-receiver BC 474 using a center loaded whip antenna for 40 and MARS 80 meter frequencies.

As noted above, Leo's day consists of a large portion of amateur radio and when not actually operating or on the job he is selling amateur radio plus MARS operation to the public and doing an excellent job of it.

—30—

Leo T. Meister, 1st Lt. USAFR, W2UMB-AF2UMB, lets Helene Donna have her turn.

Ho Hum! More Summer Specials!

MARINE TRANSMITTERS

(1) G.L. "MARINER." 100 to 125 W. RF to antenna, 100% modulated, 4 chan. xtal cont., 12 or 24 V input (specify voltage & freq. when ordering), w/Dynamotor, connecting cord, xtals, tubes (813 final), mike; all aligned and ready to operate. Controls are ON-OFF switch, chan. selector, antenna tuner to match any antenna. Built in receiver break-in relay in addition to ant. switching relay. Panel has RF current meter and total current meter. Dimensions: 8¼" deep, 17¼" wide, 19½" high. Tubes included: 1625 speech amp., 1625 osc., two 211 mod., 814 final. This xmtr built from $1200 govt. cost surplus. We offer it at the astounding price of **$225.00**

(2) ART-13-ATC. Famous Collins auto-tune xmtr. 100 W, 10 chan., freq. range 2 to 18 mc. Can be licensed for marine use with no conversion. 813 final, modulated by two 811's. Small control box permits full remote control without interfering with control at xmtr. itself. Complete with remote control box, 24 V. dynamotor with relay base, all plugs, all tubes, schematic, and calibration charts. **Excellent used condition** **$135.00**

(3) BC-223. This is the famous Scout-car set made to take a beating. 15 to 25 W output. 4 chan. xtal control.
To modify for FCC approval, just remove a few knobs and put one metal screw into the panel to keep chan. selector switch from being turned to MO position. Brand new, with tubes, used 12 V Dynamotor PE-55, connecting cable, 4 marine freq. xtals, new CAA approved mike, and reproduction of tech. manual, inc. schematic. Don't forget to specify xtal frequencies. **A LUCKY BUY PERMITS US TO OFFER IT AT ONLY** **$60.00**

MARINE RECEIVERS

(4) G.L. "MARINER." Long wave, broadcast, marine and short wave reception. A beautiful conversion of finest Navy surplus! All controls, vernier tuning, BFO ON-OFF, and AVC-MVC on entirely new front panel. Coaxial type antenna fittings furnished. Tagged wires out of rear to connect to battery, to power the DU-1 loop, and (if specified) to kill B+ with xmtr. break-in relay. 12 or 24 V DC. Compact: 15½" long, 8" wide, 6¾" high. No plugs needed; ready to go. Specify voltage **$49.50**

(5) NAVY TYPE ARA SCR-274N. 1.5-3 MC. Rewired for 12 V with brand new 12 V dynamotor mtd. on back end. Phone plug built into front, rebuilt for front panel control (ON-OFF, vol., CW-MCW, tuning). With harness and plug for 12 V input and for output to power DU-1 loop. NEW, converted **$29.50**

Same as above, but for 24 V **$24.50**

(6) DU-1 Manual Direction Finder. Goes ahead of G.L. "Mariner," ARA, or any other receiver. Converted for Marine bands, still retains half of broadcast band and all the lighthouse and beacon band. 2 tube pre-amplifier. No. 180° ambiguity. True bearing immediately. NEW, converted **$32.50**

NEW, not converted for marine **$27.50**

NOTE! COMBINATION SPECIAL

A new, marine frequency modified DU-1 Loop will be included ABSOLUTELY FREE with each purchase of the 100 W G.L. "Mariner" Xmtr and either of the receivers listed here! This offer good for July only!

(7) PE-55 DYNAMOTOR. 12 V for BC-223, 500 V @ 400 ma., w/relay, filter, etc. EXC. USED **$9.95**

(8) CONNECTING CORD with plugs, 10' long, PE-55 to BC-223 **$1.50**

(9) LORAN Special! LOng RAnge Navigation! The Coast Guard operates radar beacon stations for you. Use them! Take an accurate bearing in 40 seconds, wherever you are and regardless of weather. No night effects! Complete AN/APN-4 setup: 24 V inverter, plugs, shock mounts, receiver and indicator. **EXCELLENT USED.** "A" model, **$49.50;** "B" model **$59.50**

(10) AT LAST: A Loran Manual! All you need out of the AAF manual: schematics, theory, operation, set-up, etc., plus extra instructions and information **$7.50**

274N AND ARC-5 TRANSMITTERS

274N TYPE.	2.1-3 mc. repacks, like new	$ 9.95
T-18 ARC-5.	2.1-3 mc. repacks, like new	10.95
T-19 ARC-5.	3-4 mc. repacks, like new	10.95
	Excellent used	8.95
BC-457.	4-5.3 mc. excellent used	4.95
BC-458.	5.3-7 mc. excellent used	5.95
	As is, less xtal	2.95
BC-459.	7-9.1 mc. excellent used	9.95
	As is, less xtal	4.95
T-22 ARC-5	7-9.1 mc. repacks, like new	9.95
MD-7 ARC-5	Push-pull Modulator. EXCELLENT	9.93
BC-456. BC-442.	Racks, etc. Send for Catalogue	

274N AND ARC-5 RECEIVERS

BC-946.	Broadcast band. Unused, Good	$27.50
BC-454.	3 to 6 mc. **NEW $6.95.** Good used	$4.95
BC-455.	6 to 9 mc. **NEW $12.95.** Good used	$7.95
R-28 ARC-5.	100 to 156 mc. Excellent used	$17.50

Local Control Adaptor parts for 274N or ARC-5 recvr. Exact pot, switch, knobs, etched plate, and instruction data. Ready to mount **$1.29**
Spline tuning knob **59¢**

BC-375 100 watt xmtr unit, 200 KC to 12.5 MC when used with appropriate tuning units. With schematic showing complete parts description for use with dynamotor PE-73 and also with AC power supply conversion instructions. Xmtr only, used, special while they last, only **$12.95**

Tuning Units for BC-375. Specify freq. coverage desired. Excellent condition. With schematic showing parts description **$1.95**

AN/APS-13. Tail warning Radar xmtr-recvr. 410-420 MC with 30mc IF strip. 19 tubes: 9—6AK5, 5—6J6, 2—2D21, and VR-105. Xlnt cond. complete with all tubes and schematic **$14.95**

WANTED! Your Spare Surplus Equipment and Tubes! Dynamotors, Recrs, Smtrs, Test Equipment. Send list, stating condition and your rock bottom price. See our TV ad elsewhere in this issue.

G. L. ELECTRONICS

Note Our New Address:

905 S. Vermont Ave. Los Angeles 6, Calif.

All prices F.O.B. Los Angeles. Calif. buyers add sales tax

SEND FOR OUR LATEST CATALOGUE

SCHEMATICS—CONVERSIONS
FOR SURPLUS GEAR

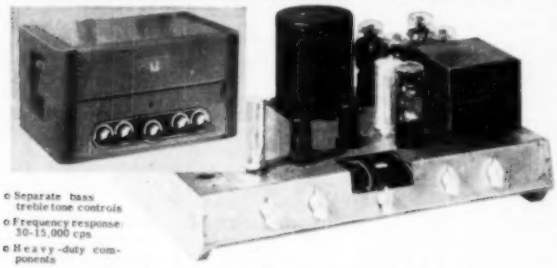
NEW LIST! MANY ADDITIONS!

Send stamped, self addressed envelope for List 8. Add 25c for chart explaining AN nomenclature.

R. E. GOODHEART **345½ N. PALM DRIVE** **BEVERLY HILLS, CALIF.**

CONCORD INTERCOMS. . the finest we've seen at this low price

35-WATT DE LUXE AMPLIFIER Only 32.45



- Separate bass treble tone controls
- Frequency response: 30-15,000 cps
- Heavy-duty components

New! Powerful 35-watt Concord Amplifier... your answer to the problem of getting top-notch heavy-duty P.A. at a bargain price. Covers audiences up to 3,000 or more persons.

Peak power output of 50 watts. Normal power output of 35 watts at less than 5% distortion. Frequency response: ± 2 db from 30 to 15,000 cps, ± 1 db from 50 to 10,000 cps. Hum level is 65 db below rated output. Separate bass and treble tone controls work on all channels.

Two high impedance microphone inputs give 125 db gain on each channel. Two phono inputs for crystal or high impedance pick-ups give 75 db gain on each channel. You can mix any 3 of the 4 channels at one time. Big, powerful output xformer--output impedances: 4, 8, 16, 60 and 250 ohms.

Rugged steel cabinet, gray hammerloid finish, 21 x 12-1/2 x 11-1/2 in. high. Power consumption, 135 watts. Heavy duty power xformer for 105-125 volt, 60 cycle AC. Tubes not included.
2-226--Shpg. wt. 43 lbs. **32.45**

Kit of tubes for above. Consists of 4-6V6GT, 1-6SC7, 1-6SG7, and 1-5U4G.
2-228--Shpg. wt. 3 lbs. **4.95**

2-STATION INTERCOM

Complete two-way inter-communication system. Ideal for homes and offices: especially suitable for nursery or sickroom. Quickly installed without special tools; easily removable for installation at another place. Remote stations may be placed as far away as 2000 feet.

Built-in amplifier uses type 50L6 and 12SJ7 tubes with a 35Z5 rectifier. Handsome molded plastic cabinets. Size 7" x 5" x 5-1/2". Supplied with tubes, cord and plug and 50 feet of intercom wire. Ready for immediate use. For 110 volts, AC or DC.
99-9582--Shipping weight 8 lbs. **12.95**
19-16013--Extra wire. . . . . Per 100 feet . . . $1.20

5-STATION MASTER

A five station intercom system suitable for use in home, office or factory. Complete, dependable two way communication to any one of five stations. Easily and rapidly installed without the use of special tools. System is complete and ready for use. For 110 volt AC or DC. Complete with one sub station and 50 ft. intercom wire.
99-9585. . . . . **18.95**
19-16148--Extra wire--per foot 1-1/20. . . . . Per 100 feet, $1.28

EXTRA SUB STATION for master 5-station intercom system.
99-9586--Complete with 50 ft. of 3 wire cable. **3.95**

CONCORD PORTABLE RADIO-PHONOGRAPH

- Powerful superhet radio
- 3-speed record player

Plays 33-1/3, 45 and 78 RPM records without needle switching or weight shifting. Gives up to 50 minutes of listening pleasure from one record. Lever controls turntable speeds. Adaptor disc supplied for 45 RPM records.

Latest expertly designed superhet radio uses following tubes: 12BE6, 12BA6, 12AV6, 50B5 and 35W4 rectifier. Built-in loop antenna in cover. Wide-range tone control. Easy-tuning clock-type dial. Handsome case finished in sturdy artificial leather. Matching plastic handle, brass hardware. Size 14-1/2 x 11-3/4 x 6-1/2 in. Complete with tubes. For 105-125 volt, 60 cycle AC.
1-547--Shpg. wt. 14 lbs. **37.50**

PM SPEAKERS

Alnico V magnet gives maximum performance with minimum weight. 3.2 ohm voice coil. Output xformer not included unless stated otherwise.

99-7009--5-in. PM. . . . **1.14**
Lots of 10, each $1.04

99-7016--5-in. PM, 2000 ohm output xformer. . . . **1.59**
Lots of 10, each $1.44

99-7044--5-in. PM, 10000 ohm output xformer. . . . **1.59**
Lots of 10, each $1.44

99-7028--6-in. PM. . . . **1.59**
Lots of 10, each $1.44

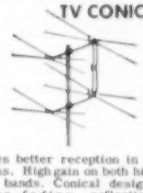
99-7045--8-in. PM. 2.15 oz. Alnico V. **1.98**

99A7046--8-in. PM, 2000 ohm output xformer. . . . **2.48**

99-7019--10-in. PM. 6.8 oz. Alnico V. **2.59**

99-7047--10-in. PM. 3.47 oz. Alnico V. Output xformer for single 6V6GT. . . . **2.98**

RELIANCE ALL BAND TV CONICALS



Gives better reception in fringe areas. High gain on both high and low bands. Conical design cuts down fading, reflections and noise. Has 20° broadside tuning angle. Direct coupling to 72-, 150- or 300-ohm lines made possible by low standing wave ration. Pre-assembled galvanized steel cross arms. Aluminum elements. Mast not included.

28-21861--Two-bay stacked conical with 1/4-wavelength jumper bar. Wt. 13 lbs. Ea. **8.45**

28-21860--Single-bay conical. For primary service areas. Wt. 7-1/2 lbs. Ea. **3.95**

STEEL MASTS. 1-1/4 in. dia. Tapered end with locking key so 2 masts can be joined together.
28-21978--5-foot Mast. Ten for $7.38. Each. . . **82c**
28-21968--10-foot Mast. Ten for $14.60. Each. . **1.62**

HOOK-UP WIRE

No. 22 stranded. Inner yarn wrap. White with red tracer cloth covering.
99-2922--Per 100 feet. **45c**
500 ft. for $1.95 1000 ft. for $3.25

No. 22 stranded. Inner yarn wrap. White with blue tracer cloth covering.
99-2923--Per 100 feet. . . . . 45¢
500 ft. for $1.95 1000 ft. for $3.25

No. 22 stranded. Inner yarn, yellow cloth.
99-2924--Per 100 feet. . . . . 45¢
500 ft. for $1.95 1000 ft. for $3.25

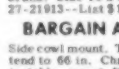
No. 22 solid. Inner yarn, orange cloth.
99-2925--Per 100 feet. . . . . 45¢
500 ft. for $1.95 1000 ft. for $3.25

No. 20 solid. Yellow rubber insulation.
99-2926--Per 100 feet. . . . . 49¢
500 ft. for $2.24 1000 ft. for $3.75

ICA "TENNA BEAM"

The auto antenna that lights up. Quickly installed on fender or cowl of any car. Pilot light in base shines through light transmitting jacket to give a 24-in. shaft of light. Excellent for use as a safety parking light. Two sections extend to 48-in. 48-in. shielded lead-in cable. Chrome-plated Admiralty brass.
27-21914--Wt. 2 lbs. . **4.09**

"VIDI TENNA"



Adds "zip" to appearance of your auto antenna. Gives equivalent of 52 in. of extra aerial for improved reception. Triple chrome-plated Admiralty brass. Size 10 x 3 x 3 in.
27-21913--List $1.95. Wt. 10 oz. . **1.15**

TUBE BARGAINS

Some boxed--some bulk. All famous name brands—GE, RCA, Sylvania, etc. Quantities limited.

Type	Ea.	Type	Ea.
2V3G	59¢	6SR7	69¢
5U4G	59¢	6V6GT	59¢
6AT6	59¢	7C5	59¢
6BA6	69¢	12SA7GT	69¢
6BE6	69¢	12SK7GT	69¢
6F6G	69¢	12SQ7GT	63¢
6H6	49¢	35Z5GT	49¢
6J7	49¢	50B5	69¢
6N7	79¢	50L6GT	69¢

99-2905--OD3/VR150 special purpose tube. (Lots of 10, ea. 39¢) Ea. **44c**

DUAL SPST SWITCH

Bat handle. 3 amps, 125V. One side momentary contact, spring return. Other side positive contact.
99-4180--Each. . . . **18c**
10 for $1.65

BARGAIN AUTO ANT.

Side cowl mount. Three sections extend to 66 in. Chrome plated. Adjustable mount fits any car. With 36-in. lead and mfg. hardware
99-9571--Each. **98c**
Lots of 10, each 85¢

TVI FILTER

Drake Hi-Pass Interference Filter. Improves TV reception by rejecting interference below 50 MC from amateur xmitters, diathermy, etc. Does not reduce strength of TV signal.
5-12525--300 ohms. Ea. . **3.50**
5-12508--72 ohms. Ea. . $3.50

EXPORT: Address all export orders and inquiries to Concord Radio EXPORT DIVISION, 901 W. Jackson Blvd., Chicago 7, Ill.

CONCORD RADIO

Mail Order Center and Showroom
901 W. Jackson Blvd., Chicago 7, Ill.
Branch Showroom: 265 Peachtree St., Atlanta 3, Ga.

CONCORD RADIO CORP. Dept. RG-50
901 W. Jackson Blvd., Chicago 7, Ill.

☐ Enclosed $ . . . . . (Include shipping charge.
Any excess will be refunded.) Rush me the following equipment:

☐ **Send FREE latest Catalog & Bargain Bulletin.**

Name . . . . . .
Address . . . . . .
City . . . . . Zone . . . . . State . . . . . .

Get MORE stations...

CLEARER pictures...

make COSTLY TV TUBES LAST LONGER with a

TRYLON TV MAST

As almost every dealer knows by now, built-in television antennas are really satisfactory in only a small percentage of installations. Even indoor antennas often leave a lot to be desired. But that's only part of it!

AVOID TUBE STRAIN!

Indoor antennas of any kind usually mean that sets must be operated at high volume. This means a big reduction in tube life—including the costly picture tubes!

An outdoor antenna mounted on a Trylon Mast assures clear pictures, reduces interference, brings in more stations. Also, it enables the set to operate at lower power with a minimum of tube strain. A leading dealer states: "I'm convinced that a Trylon Mast actually pays for itself in what it saves the TV set owner on tube replacements!"

★

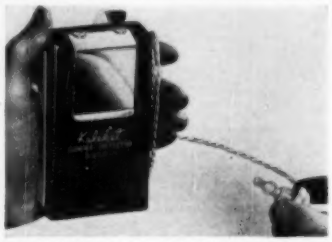
Trylon TV Masts are easy to install—safe and easy to climb. Supplied in 10-foot sections for heights to 60 feet. Weight is about 2 lbs. per foot at a dealer cost of only about $1.00 per foot. They're hot dip galvanized against the weather—designed for real dependability under all conditions. Write for Catalog N.

WIND TURBINE CO.
Mast and tower specialists for over 17 years
WEST CHESTER, PENNA.

What's New in Radio

(*Continued from page 76*)

Designated the Model K-550, the new unit measures only 4¾" x 2⅝" x 1⅛" and weighs just ten ounces. The detecting element is a subminiature type, 300 volt Geiger tube. The normal back-



ground response of the instrument to cosmic radiation is approximately 12 counts per minute.

The power supply is completely self contained and consists of two types of easily-obtainable batteries. The batteries may be replaced easily and quickly. The instrument itself has only one control, a simple "on-off" switch.

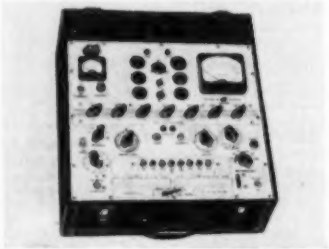
Full details are available on request to the company. Address inquiries to 155 East Sixth Street in Covington.

TUBE TESTER

A new laboratory type instrument, built to test all of the latest subminiature tubes, including television, with professional accuracy has been introduced by *The Hickok Electrical Instrument Company* of 10524 Dupont Avenue, Cleveland 8, Ohio.

Known as the Model 539, the new tube tester is designed for maximum accuracy throughout. The scale reads directly in micromhos. A separate meter permits the accurate adjustment of line voltage while the tube is under test. Provision is made for inserting a plate milliammeter to read plate current of the tube being tested.

The instrument has three a.c. signal voltages, .25, .5, and 2.5 volts in addition to the d.c. grid bias and d.c. plate and screen voltages. Provision is made



for self bias and for vernier adjustment of bias for those who prefer it. This feature is accomplished by a 200 ohm rheostat with calibrated dial, bypassed by a 1000 μfd. condenser which can be inserted in the cathode circuit by operating a switch.

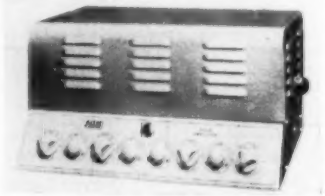
The unit is built into a portable carrying case with leatherette cover. It measures 17" x 18" x 18½" and weighs 31 pounds. It operates on 110-130 volts a.c.

NEW AMPLIFIER LINE

The *Altec Lansing Corporation* of 1161 N. Vine Street, Hollywood 38, California, has made available a new series of amplifiers designed specifically for use with the company's miniature condenser microphone.

By means of newly developed circuits, the new amplifiers eliminate the need for several elements now necessary in microphone amplifier systems. The power for the condenser microphone impedance matching tube is obtained from the amplifier rectifiers. No input transformers or input matching transformers are required.

The first of the new series to be put on the market is the A-332A, an 18 watt portable p.a. unit. Three inputs are provided, two for the *Altec* miniature condenser microphone, and one for a variable reluctance phonograph pickup. Each of the three channels is provided with independent gain and



bass controls. A high frequency droop control is provided for all input channels.

NEW SPEAKERS

Permoflux Corp. of 4900 W. Grand Avenue, Chicago 39, Illinois, has recently introduced a new 8" speaker unit which features a blue cone and is said to be capable of covering over 10,000 cycles with unusual sensitivity and fidelity.

A specially treated, slotted cone edge, a new *Permoflux* development, provides extra soft suspension of the cone, thereby increasing the low frequency response. This low frequency response is further aided by an enlarged lower suspension. The curvilinear cone has been throat-treated to extend the high frequency response.

The "Royal Eight," Model 8T-8-1, allows the use of a smaller baffle yet provides performance comparable to that of most 12" speakers, according to the company. An illustrated catalogue on this new speaker is available on request.

AM-FM TUNER

The *Meissner Manufacturing Division, Maguire Industries, Inc.*, of Mt. Carmel, Illinois, has announced the addition of the Model 9A AM-FM tuner to its line of radio equipment.

The new tuner has been designed to be used in original equipment or for

"NIAGARA'S" 4th ANNIVERSARY CELEBRATION

LOW PRICED TUBES AND HIGH PASS FILTERS

BANISH TV INTERFERENCE with NIAGARA'S FAMOUS HI-PASS FILTER!

Positive protection against interference from radar, amateur transmitters, diathermy, and all other devices generating RF interference. Fits any 300 ohm antenna feeder. Absolutely no loss in brightness or clarity. Complete instructions and findings under actual test included.

KIT (all parts included) $1.95
Wired and Tested .. 2.95

Plus 15c postage and handling in U.S.A.

ALL BRAND NEW—STANDARD BRANDS

1B22	$ 3.45
1B23	8.45
1B24	4.45
1B25A	4.95
1B26	4.45
1B27	3.95
1B29	.89
1B32	1.95
1B38	34.50
1B60	4.95
1N21	.89
1N23	.69
1P23	1.95
1P25	14.50
1S21	2.95
2AP1	3.59
2B22	3.95
2C4	1.18
2C21	.25
2C22	.28
2C26A	.18
2C34	.25
2C40	2.98
2C43	9.50
2C44	1.75
2C46	7.50
2C51	6.50
2D21	1.16
2E22	1.25
2E24	4.95
2E25A	4.25
2E26	3.95
2E30	2.39
2J21A	10.75
2J26	6.95
2J27	13.95
2J30	19.95
2J31	8.95
2J32	11.95
2J33	19.95
2J34	19.50
2J36	75.00
2J37	12.95
2J38	12.95
2J48	24.50
2J49	19.50
2J50	29.50
2JB51	4.95
2J54B	24.95
2J61	24.50
2K23	24.95
2K25	24.95
2K28	24.95
3AP1	4.75
3B22	2.50
3B23	4.95
3B24	1.98
3B24W	2.95
3B25	4.80
3B26	1.50
3B27	1.95
3E28	5.95
3BP1	2.50
3C23	2.25
3C24	.35
3C30	.30
3C31	3.50
3C45	12.80
3CP1	1.40
3DP1-A	3.95
3D21A	1.10
3EP1	2.50
3E29	7.95
3FP7	1.75
3GP1	4.95
3HP7	3.50
3JP7	7.95
4-65A	14.50
4-125A	27.50
4-250A	37.50
4A1	.98
4AP10	4.50
4B25	7.90
4C21	.69
4C35	19.45
4D22	9.95
4D32	12.95
4E27	12.50
4J26	110.00
5AP1	1.85
5AP4	1.85
5BP1	1.75
5BP4	2.50
5C22	49.50
5CP1	1.50
5CP1A	9.95
5D21	24.50
5FP7	1.25
5GP1	5.50
5HP1	2.95
5HP4	9.95
5HP7	3.95
5J23	100.00
5J29	12.50
5JP1	24.50
5JP2	9.50
5LP1	11.95
5LP5	14.50
5MP1	4.95
5NP1	1.98
6AF6G	.88

6AS6	2.89
6C21	24.95
6F4	5.95
6J4	4.95
7BP1	4.95
7BP7	4.50
7C23	75.00
7C25	90.00
7DP4	17.95
9C23	250.00
9GP7	15.00
9JP1	6.50
9LP7	15.00
6NP1	7.95
10Y	.39
10SPEC	.69
10BP4	22.45
10CP4	29.50
12DP7	12.50
12FP7	14.95
12GP7	12.95
12HP7	12.95
12KP4	49.50
12LP4	25.50
15E	1.25
15R	.50
23D4	.49
24G	.35
35T	4.95
45SPEC	.25
53A	24.95
75TL	3.50
100TH	11.00
100TS	2.00
101F	4.95
114A	.69
114B	1.25
121	5.95
121A	2.65
203A	16.95
205B	4.50
205F	4.50
211	.40
215A	.50
217C	9.80
219	12.50
221A	1.75
227A	2.65
231D	1.20
249C	1.75
250R	7.00
250TH	19.50
252A	4.95
259A	4.95
274B	1.00
275A	7.95
282A/B	9.95
283A	10.95
285A	10.95
287A	9.95
290A	4.95
291A	4.95
294A	4.50
301A	6.95
304B	5.95
304TH	3.50
304TL	1.30
307A	4.95
310A	7.95
315A	6.95
316A	.50
327A	2.50
331A	14.50
338A	3.75
348A	5.95
350A/B	2.75
354C/D	19.95
357B	49.50
371A/B	.50
374A	2.50
393A	3.50
394A	3.50
399A	2.50
400A	3.25
401A	1.95
403A/B	1.75
417A	9.50
434A	2.75
446A	1.00
446B	1.95
450TH	24.95
450TL	35.00
464A	9.50
527	6.50
531	4.95
532A	4.95
631P1	4.95
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704	1.49
705A	1.00
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750TL	49.50
800	1.75
801A	.28
802	4.25
803	3.45
804	8.50
805	3.50
807	1.25
808	1.35
809	2.50
810	7.75
811	2.00
812	2.50
812H	6.90
813	6.75
814	2.40
815	1.25
816	1.19
826	.35
828	9.95
829A/B	7.25
830	2.95
830B	3.25
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834	5.50
836	1.25
837	1.50
838	2.25
841	.30
843	.25
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851	25.00
860	5.75
861	35.00
864	.35
865	1.95
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866JR	1.19
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874	.35
876	.28
878	1.75
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885	.98
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905	2.75
922	1.00
923	.75
925	1.40
931A	2.60
949A	69.50
950	.98
954	.30
955	.35
956	.35
957	.19
958A	.18
959	.35
966A	.99
977A	2.95
975A	14.95
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1613	.45
1614	1.35
1616	.50
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1620	4.95
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1622	1.75
1624	1.05
1625	.35
1626	.25
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1631	1.35
1633	.75
1634	.79
1636	3.50
1638	.75
1641	.45
1642	.25
1644	1.49
1645	1.98
1649	1.25
1654	2.40
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8011	2.00
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8013A	1.25
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RK23	4.75
RK25	4.95
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RK34	.25
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0A3/VR75	.98
0A4G	.94
0B2	1.74
0B3/VR90	.64
0C3/VR105	.78
0D3/VR150	.54
0Y4	.88
0Z4	.56
0Z4G	.56
01A	.24
1A3	.43
1A4	1.08
1A4P	.96
1A5GT	.48
1A6	.78
1A7GT	.66
1B3GT	1.49
1B4	1.18
1B5/25S	.88
1B7GT	1.06
1C5GT	.66
1C6	.88
1C7G	.88
1D5GP	.96
1D7G	.88
1D8GT	.94
1E5GT	1.38
1E7G	1.56
1F4	.74
1F5G	.74
1F6	1.56
1F7G	1.56
1G4GT	.68
1G6GT	.68
1H4G	.68
1H5GT	.53
1H6G	.86
1H6GT	.86
1J6GT	.88
1L4	.54
1LA4	.78
1LA6	.88
1LB4	.88
1LC5	.78
1LC6	.56
1LD5	.78
1LE3	.88
1LG5	.88
1LH4	.64
1LN5	.66
1N5GT	.58
1P5GT	.66
1Q5GT	.66
1R5	.68
1S4	.78
1S5	.56
1T4	.56
1T5GT	.78
1U4	.58
1U5	.72
1V	.68
2A3	.96
2A4G	1.06
2A5	.68
2A6	.78
2A7	.88
2B7	.88
2V3G	.98
2X2A	.68
3A4	.36
3A5	.98
3A8GT	1.98
3B7	.34
3D6	.34
3LF4	1.28
3Q4	.58
3Q5GT	.66
3S4	.66
3V4	.80
5AZ4	.50
5JP1	24.50
5R4GY	1.09
5T4	.88
5U4G	.56
5V4G	.88
5W4	.78
5W4GT	.66
5X4G	.58
5Y3GT	.40
5Y4G	.48
5Z3	.48
5Z4	.78
6A3	1.28
6A6	.88
6A7	.68
6A8	.78
6A8GT	.80
6AB5/6N5	.88

6AB7/1853	.78
6AC5GT	1.16
6AC7/1852	0.76
6AD6	.88
6AD7G	1.28
6AF6G	.78
6AG5	.76
6AG7	.97
6AH6	1.28
6AJ5	.78
6AK5	.84
6AK6	.78
6AL5	.64
6AL7GT	1.06
6AQ5	.58
6AQ6	.58
6AQ7GT	.88
6AR5	.68
6AS7G	4.95
6AT6	.46
6AU6	.58
6AV6	.46
6B4G	.88
6B5	1.56
6B6G	.78
6B7	.88
6B8	.88
6B8G	1.28
6BA6	.54
6BE6	.56
6BG6G	1.46
6BH6	.86
6BJ6	.58
6C4	.24
6C5	.46
6C5GT	.46
6C6	.56
6C7	1.28
6C8G	.68
6D6	.16
6D8G	.87
6E5	.68
6E6	1.06
6F5	.46
6F5GT	.46
6F6	.64
6F6GT	.66
6F7	.84
6F8G	.86
6G6G	.88
6G8G	.68
6H6	.46
6H6GT	.46
6J5	.48
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6J8G	1.28
6K5GT	.96
6K6GT	.54
6K7	.48
6K7GT	.48
6K8	.78
6K8GT	.78
6L5G	1.06
6L6	1.16
6L6G	.86
6L6GA	.86
6L7	.78
6L7G	1.16
6N6G	1.56
6N7	.78
6N7GT	.78
6P5GT	.96
6Q6G	1.06
6Q7	.58
6Q7GT	.58
6R7	.78
6R7GT	.78
6S7	.88
6S7G	.88
6S8GT	1.06
6SA7	.43
6SA7GT	.43
6SB7Y	.88
6SC7	.58
6SD7GT	.68
6SF5	.48
6SF5GT	.54
6SF7	.58
6SG7	.58
6SH7	.48
6SJ7	.56
6SJ7GT	.56
6SK7	.54
6SK7GT	.54
6SL7GT	.64
6SN7GT	.64
6SQ7	.43
6SQ7GT	.43
6SR7	.56
6SR7GT	.56
6SS7	.58

6ST7	.88
6SV7	.88
6T7G	.97
6U5/G5	.64
6U6GT	.72
6U7G	.54
6V6	.96
6V6GT	.62
6W7G	.88
6X4	.58
6X5GT	.48
6Y6G	.66
6Y7G	.88
6Z7G	1.14
6ZY5G	.68
7A4/XXL	.58
7A5	.72
7A6	.66
7A7	.56
7A8	.72
7AD7	1.06
7AF7	.72
7AG7	.71
7AH7	.88
7B4	.56
7B5	.72
7B6	.58
7B7	.58
7B8	.72
7C4/1203A	.38
7C5	.56
7C6	.72
7C7	.58
7E5/1201	.66
7E6	.58
7E7	.68
7F7	.68
7F8	1.06
7G7/1232	1.06
7H7	.63
7J7	1.06
7K7	1.06
7L7	.66
7N7	.66
7Q7	.58
7R7	.63
7S7	1.06
7V7	.79
7W7	.84
7X7/XXFM	.88
7Y4	.56
7Z4	.56
10	.69
12A	.56
12A6	.18
12A6GT	.18
12A7	.97
12A8GT	.58
12AH7GT	.84
12AL5	.60
12AT6	.44
12AT7	1.16
12AU6	.66
12AU7	.78
12BA6	.56
12BE6	.48
12C8	.48
12F5GT	.57
12H6	.26
12J5GT	.26
12J7G	.80
12J7GT	.80
12K7GT	.53
12K8	.58
12K8GT	.66
12Q7GT	.48
12SA7	.56
12SA7GT	.56
12SC7	.56
12SF5	.56
12SF5GT	.56
12SF7	.56
12SF7GT	.56
12SG7	.56
12SH7	.34
12SJ7	.48
12SJ7GT	.48
12SK7	.56
12SK7GT	.56
12SL7GT	.58
12SN7GT	.51
12SQ7	.48
12SQ7GT	.48
12SR7	.48
12SR7GT	.48
12Z3	.78
12X3	.98
14A7/12B7	.68
14AF7/XXD	.88
14B6	.68

14B8	.88
14C5	.88
14C7	.88
14E6	.72
14E7	.88
14F7	.68
14F8	.88
14H7	.64
14J7	1.06
14N7	.88
14Q7	.56
14R7	.66
14S7	1.06
14W7	1.06
14X7	1.06
14X4	.88
19	.97
19T8	1.56
22	1.28
24A	.66
25A6	1.06
25A6G	1.06
25AC5GT	1.16
25L6GT	.52
25Y5	1.16
25Z5	.48
25Z6GT	.48
26	.56
27	.46
28D7	.34
30	.56
31	.86
32	.96
32L7GT	.96
33	.68
34	.68
35/51	.56
35A5	.66
35B5	.64
35L6GT	.53
35W4	.38
35Y4	.48
35Z3	.56
35Z4GT	.43
35Z5GT	.40
36	.39
37	.34
38	.27
39/44	.26
41	.51
42	.48
43	.48
45	.51
45Z3	.56
45Z5GT	.48
46	.68
47	.68
49	.88
50	1.56
50A5	.68
50B5	.54
50L6GT	.54
50Y6GT	.56
51	.86
56	.43
57	.37
58	.48
59	.88
70L7GT	1.16
71A	.66
75	.52
76	.38
77	.42
78	.44
79	.88
80	.38
81	1.28
82	.86
83	.71
83V	.88
84/6Z4	.62
85	.68
89	.72
89Y	.38
117L7GT	1.28
117M7GT	1.56
117N7GT	1.36
117P7GT	1.28
117Z3	.56
117Z4GT	1.16
117Z6GT	.64
FM-1000	1.28
UX120	1.38
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9002	.28
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9004	.36
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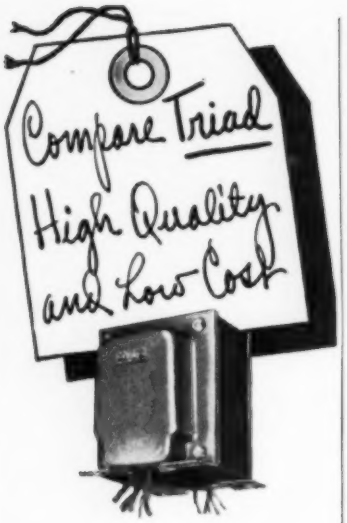

The Triad high-fidelity output transformers listed below afford a standard of performance exceeded only by the Triad "HS" Series outputs. Embodying a simplified, inexpensive construction through the use of mass production die-stamped cases and flexible leads, costs on these transformers are held to a minimum without affecting performance.

These transformers are designed with plenty of the highest quality core material and with interleaved windings of low resistance. These coils have a frequency response linear within 1 db. from 30-15,000 cycles and will deliver their full rated output within 3 db. over this entire range of frequencies. Their high open circuit reactance and low leakage reactance will permit their use within feedback loops employing as high as 30 db. of negative feedback.

Compare these Specifications and Prices

Type No.	Primary Impedance	Secondary Impedance	Output Watts	List Price
S-31A	8000 C.T.	4-8-16	15	$8.75
S-33A	3000 C.T.	4-8-16	15	8.75
S-35A	5000 C.T.	4-8-16	18	9.50
S-38A	9000 C.T.	4-8-16	25	12.50
S-40A	2500 C.T.	4-8-16	30	12.50
S-42A	4500 C.T.	4-8-16	50	19.50
S-43Z	4000 2000/ 1000 500	4-8	10	4.75
S-46A	2000 1000/ 500 250	4-8-16	20	11.00

Circuit diagrams for the most effective use of these transformers, plus data and prices on the entire Triad line, are shown in Catalog TR-49-A, free on request.

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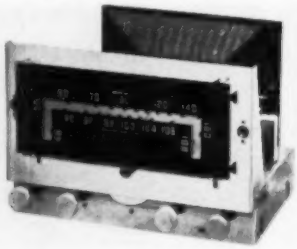
converting older radios, adding not only new AM but FM and a phonograph combination as well.

The 9A tuner chassis includes complete provision for phono input, high selectivity and sensitivity, full audio



fidelity, and heavily oversized components. In addition, there is temperature compensation on FM, full tone control, built-in phono switching and power outlet for a phono motor. All controls are on the front panel and are also operative on phono.

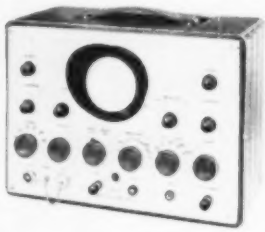
SERVICE OSCILLOSCOPE

A new portable service-type oscilloscope which will sell in the moderate price class has been introduced by the Test and Measuring Equipment Section of *Radio Corporation of America*, Camden, New Jersey.

According to the company, the Type WO-57A is versatile enough for use in every phase of radio and television servicing. For television servicing the unit has the required high sensitivity and wide frequency range which is equally useful in the shop, laboratory, or factory, for viewing and measuring square waves, pulses, and TV sync signals.

The deflection sensitivity of the instrument is better than 30 millivolts per inch. The frequency response of the vertical amplifier is flat within 2.3 decibels from zero to 500 kc. down only 6.8 db. at 1 megacycle, and useful beyond 2 megacycles.

The outstanding design feature of the new unit is the direct-coupled ver-



tical amplifier which is used to provide flat low-frequency response. High-frequency square wave response up to 100 kc. enables the WO-57A to reproduce blanking and sync pulse wave shapes with fidelity formerly not available in oscilloscopes selling in this price range.

Full details are available from all *RCA* test equipment distributors.

—30—

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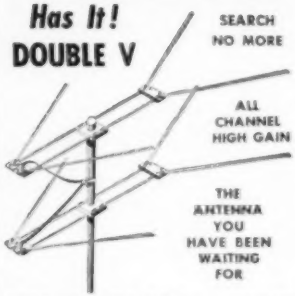

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1307-1313—Five El. Yagi any Hi-Channel	4.95
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2102—DeLuxe Indoor Antenna	1.95
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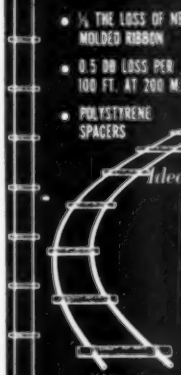

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- COMMERCIAL
- FRINGE AREAS
- LONG RUNS
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GONSET CO., BURBANK, CALIF.

Ghosts

(*Continued from page* 41)

pole antenna will work wonders with a selected length of temporary 300-ohm lead-in. Different lengths are tried once the best position and orientation of the antenna are located. Loose wire can be coiled and arranged at the set while watching the reflections.

An improperly placed stand-off or lightning arrester may introduce reflected wave energy into the line. For having once found the place where a search antenna with temporary run gives good pictures, one must naturally exercise care at every point in the securing or routing of the lead-in from antenna to set.

All one has to do is experiment with a half-wave open stub at the set's antenna terminals, and it is forever impressed on his mind how sensitive certain points along a transmission line can become. This is especially true of a set without automatic gain control on the picture circuits. With due regard for metal window sash, drain-pipes, roof flashing, phone and power lines, and anything at all electrically conductive, he will end up with a transmission line routed with all possible separation from these things. Generally speaking, a few inches is sufficient and all that one can attain. Where there isn't high signal strength, a half-inch will suffice.

Incidentally, television leads have been cut by telephone maintenance men where they passed within six inches of the telephone company's wires.

Close-in ghosts should always be checked with a piece of transmission line attached at the set and tuned experimentally with a razor blade. Beginning six inches from the terminals of the set, the stub is shorted in half-inch steps. Here a mirror or an interested, willing helper becomes a must, particularly with the consoles and large-screen sets of today. Frequently an improvement in gain will be noticed. Certain lengths of shorted stub may make the reflections stronger. If anything is unbalanced, poorly soldered, or even open-circuited in the antenna system, this method of tuning can make you look like a magician. It has often shown spectacular results. It may prevent the expense and nuisance of repair or replacement of a whole antenna and line run. A closed stub of only a few inches, adjusted critically, will improve reception in many instances. Tuned correctly to aid reception on any one channel, it will not harm reception on others.

This article naturally does not present formulas or methods for tuning lines or trapping any interference other than the original frequency in the form of a ghost. It is understood that a ghost is recognized. If transients or other effects, due to improper alignment of the set itself, are apparent in the pictures, no amount of work on

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This TORQUE DRIVE* vertical-type crystal cartridge is being used more and more in original equipment and for replacement. The 32 series greatly improves 78 rpm reproduction–saves record wear. The 34 series for 33⅓ and 45 rpm beautifully plays the new wide-range, high fidelity recordings–tracks perfectly at 5 grams pressure. The 33 series handles *all three* speeds, with remarkable efficiency. All specially moisture protected for extra long life. Has ½" and ⅝" hole spacing. Color coded. Simple to install. Replaceable osmium-tip or sapphire-tip needles.

*E-V Pat. Pend. Licensed under Brush patents.

SERIES 12 and 14

The Series 12 TORQUE DRIVE crystal cartridge replaces over 150 types in general use for 78 rpm. Saves time and work–speeds servicing. Gives better reproduction and *longer* record life. Series 14 for 33⅓ and 45 rpm is performing brilliantly in thousands of record changers. Tracks perfectly at 5 grams pressure. Color coded. Replaceable osmium-tip or sapphire-tip needle.

SERIES 16 TWILT FOR ALL 3 SPEEDS

Superbly plays 33⅓, 45 and 78 rpm records with a single twin-tip replaceable needle without weight change, with tracking pressure of only 6 grams, and does it with TORQUE DRIVE efficiency. You merely tilt the Twilt and select the 1-mil or 3-mil needle tip for fast or slow speed records. Setdown is accurate. Mounts easily in most any standard pickup arm, with nothing more required than reducing needle pressure. Also available without tilting mechanism.

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the antenna system will ever do any good. Although, however, many *tunable* transients can be directly traced to the antenna installation. These, a tuned stub can trap out without any difficulty. In any case where there is doubt as to the origin of transients or close reflections, applying the right stub won't hurt. An open-end antenna, because of a high mismatch, more often requires this stub tuning than a folded dipole, yet the simpler antenna is favored in a reflected area, where, as has been mentioned before, the signal strength is usually high.

Ghosts show up as shadows and are even more troublesome on the proposed ultra-highs and with color transmission, so there's no sense in waiting. You've got a ghost, and if you throw away your antenna and end up with a delta match on the guyed-mast itself, it's perfectly acceptable if it kills the ghost.

—30—

OSC. TUBE REPLACEMENT IN TV TUNERS

By MATTHEW MANDL

WHEN replacing defective local oscillator tubes in television receivers the technician usually finds that the center setting of the stations has been disturbed and often the fine tuning control is no longer able to make adequate adjustment. Rather than go through the process of retuning each oscillator slug for every station the technician should try several oscillator tubes until one is found which has interelectrode characteristics close enough to the old one so that the frequency change is not too great.

The service notes for the particular set under repair should also be consulted because several manufacturers are now including a master oscillator adjustment on their tuners so that an over-all change in oscillator frequency can be compensated without the necessity for tuning the individual oscillator slugs for each station. This control is usually located on top of the tuner near the oscillator tube and a slight adjustment will bring the oscillator tuning back to its previous setting.

—30—

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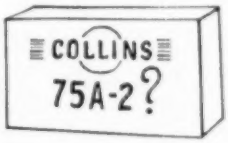

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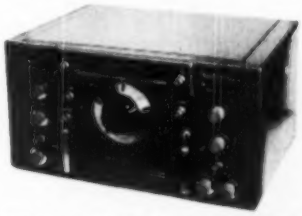

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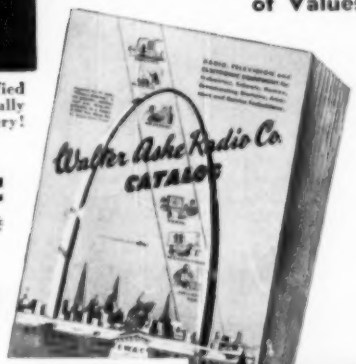

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AFCA CHAPTER NEWS

Augusta—Camp Gordon

The regular monthly meeting was held at the Signal Corps Demonstration Building on April 12th.

A motion was introduced and passed whereby a sum of $25.00 was made available to partially defray expenses of a member to the national convention in New York on May 12th and 13th. Delegates to the convention are: Lt. Col. Henry J. Hort, chapter president, and Hugh A. Fleming of *Southern Bell T&T Co.*, former chapter president.

Chicago

The Society of Motion Picture and Television Engineers and the Chicago Section of the IRE were hosts to the Chicago Chapter at a meeting held at the Drake Hotel, April 24th.

After a 6 p.m. dinner at the Officers Club in the Knickerbocker Hotel, chapter members adjourned to the Grand Ballroom of the Drake to hear a discussion by Frank H. McIntosh, consulting engineer from Washington, D.C., on the "Properties and Characteristics of Color TV Systems Proposed to the FCC." His talk covered the *CBS*, *RCA*, and *CTI* systems.

Col. John R. Howland, *Zenith Radio Corp.*, spoke on "Phonevision" and presented a film demonstrating the new television service.

Cleveland

The Cleveland Chapter's April 13th meeting took place in the auditorium of the Telephone Building and featured "Nationwide Television Networks" as the subject of the evening. In the preliminary portion, Robert Clark of the public relations staff, *Ohio Bell Telephone Company*, presented a very interesting and enlightening demonstration on the principles of radio relay and microwave transmission.

A. M. Rose, division transmission engineer of the Long Lines Department, *American Telephone and Telegraph Company*, discussed some of the problems associated with furnishing television service on network facilities. The *Bell System* film, "Stepping Along with Television," closed the discussion, and the group was then conducted through the microwave terminal facilities located on the top floor of the Telephone Building.

A third item in the inspection tour was the control room and terminal equipment associated with coaxial cables terminating in Cleveland.

Decatur

The new officers of the Decatur Chapter are: Robert C. McMurtrey, president; Earl L. Chrisman, 1st vice-president; Kenneth C. Colman, 2nd vice-president; Edward C. Whitcomb, secretary-treasurer.

At its April 27th meeting, the chapter decided to send Edward C. Whitcomb and Sherman F. Hickman as delegates to the AFCA national convention in New York.

President McMurtrey informed the group of the plans being made for a chapter meeting in July at the time the Signal Depot Commanders' Conference will be held in Decatur.

Captain Kenneth Colman then presented motion pictures of the highlights of the 1949 World Series baseball games.

European

Members of the European Chapter met in Frankfort on April 14th. Lt. Col. Steve J. Gadler, chapter president and chief of the USAFE supply control division, presided at the annual meeting which followed a dinner at the Frankfurt Casino.

Speakers for the evening were Maj. Gen. Jerry V. Matejka, chief of the EUCOM signal division, and Col. David C. G. Schlenker, USAFE director of communications.

New officers were elected as follows: President—Col. I. P. Doctor; Vice-Presidents—Col. E. B. Garland and Mr. G. A. Spear; Treasurer—H. E. Aldridge; Secretary—C. E. Laurendine.

Fort Monmouth

Col. George P. Nixon, national executive secretary of AFCA, addressed

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0B3/VR90	.65	3C23	3.75	249C	1.49	816	.99	9005	1.35	0B2	1.67	6A3	.92	6SN7GT	.54	12Z3	.69
0C3/VR105	.69	3C24/24G	.35	250R	5.95	826	.39	9006	.15	0Z4	.57	6A4LA	1.09	6SQ7	.45	14A4	.79
0D3/VR150	.48	3C30/809	1.89	250TH	18.95	828	10.95	C1JA	9.95	01A	.39	6A6	.79	6SR7GT	.52	14A7	.52
1B21/GL471A	2.87	3C31/C1B	2.98	250TL	18.95	829	7.45	C5B	6.95	1A3	.44	6A7	.69	6SS7	.49	14B6	.67
1B22	2.87	3C45	12.95	274B	2.69	830B	3.19	C6A	7.95	1A4	1.09	6A8	.75	6ST7	.72	14F7	.69
1B23	8.75	3CP1	1.39	293A	2.98	832A	4.89	C6J	3.65	1A4P	.97	6AB7	.79	6SU7GTY	1.25	14F8	.79
1B24	4.59	3DP1	1.79	294A	2.95	833A	33.95	C100D	.98	1A5GT	.49	6AC7	.74	6SV7	.79	14H7	.59
1B26	2.79	3DP1-S2A	2.79	300B	9.95	836A	1.97	CK502AX	2.25	1A6	.79	6AD7G	1.09	6T7G	.89	14J7	.87
1B27	7.95	3D21A	.98	304TH	3.49	837	1.19	CK503AX	1.95	1A7GT	.67	6AF6G	.79	6U5G	.65	14N7	.85
1B29	.79	3EP1	2.59	304TL	1.29	838	1.98	CK505AX	2.25	1AB5	.59	6AG5	.69	6U6GT	.61	14Q7	.53
1B32	1.89	3E29	8.95	305A	24.95	841	.29	CK506AX	1.95	1B3/8016	1.15	6AG7	.98	6U7G	.49	14R7	.67
1B36	3.95	3FP7	.97	307A	3.69	843	.29	CK507AX	1.95	1B4	1.19	6AH6	1.29	6V6	.89	19	.69
1B38	36.50	3GP1	5.95	316A	.29	845	4.25	CK512AX	2.25	1B5/25S	.89	6AJ5	.79	6V6GT	.57	24A	.49
1D21	3.75	3HP7	3.95	327A/5C37	2.75	851	12.95	CK571AX	8.45	1C5GT	.59	6AK5	.85	6W4	.63	25L6GT	.53
1N21	.49	4-65A	14.21	331A	12.95	860	14.95	CK1005	.09	1C6	.89	6AK6	.79	6W7G	.77	25Z5	.44
1N21A	.89	4-125A	26.05	350A	1.98	861	9.95	CK1006	.85	1C7G	.89	6AL5	.59	6X4	.57	25Z6GT	.43
1N21B	1.39	4-250A	36.25	350B	1.39	864	.29	CK1007	.89	1D5GP	.97	6AQ5	.49	6X5GT	.47	26	.49
1N22	.98	4AP10	1.98	368A/S	4.98	865	.79	E1148	.29	1D7G	.89	6AQ6	.59	6Y6G	.67	27	.47
1N23	.79	4B22	9.98	371B	.49	866A	1.05	EF50	.39	1D8GT	.95	6AR5	.52	6Z7G	.98	28D7	.35
1N23A	.79	4B24	1.98	388A	.47	866JR	1.05	F123A	7.95	1F4	.75	6AT6	.44	6ZY5G	.59	30	.37
1N23B	1.89	4B25	7.95	393A	3.69	869B	26.50	F127A	15.95	1F5G	.75	6AU6	.59	7A4/XXL	.49	31	.59
1N27	1.29	4B26	4.49	394A	3.69	872A	1.12	F128A	69.50	1G4GT	.69	6AV6	.47	7A6	.59	32	.85
1N34	.82	4B28	2.47	417A	9.95	874	.39	F606	37.50	1G6GT	.65	6B4G	.89	7A7	.53	32L7GT	.89
1P23	2.49	4B32	9.95	446A	1.25	876	.29	F660	49.50	1E7G	1.15	6B6G	.79	7AG7	.72	33	.69
1P24	.59	4C35	19.38	446B	1.79	878	1.98	F862A	397.50	1H4G	.55	6B7	.87	7B4	.53	34	.37
1P36	2.85	4D22	9.95	450TH	19.95	884	1.19	FG17	2.69	1H5GT	.54	6B8G	.69	7B5	.67	35/51	.57
1S21	3.95	4D32	9.95	450TL	44.50	885	1.19	FG27A	6.95	1H6GT	.87	6BA6	.55	7B6	.56	35A5	.63
2AP1	3.89	4E27/257B	12.45	527	5.95	902	3.39	FG32	4.95	1J6G	.75	6BE6	.52	7B7	.59	35B5	.55
2C21/RK33	.24	5AP1	2.95	559	.98	905	2.49	FG33	7.95	1L4	.48	6BF6	.57	7C4	.34	35C5	.59
2C22/7193	.15	5AP4	2.95	575A	11.95	908	4.95	FG57	12.95	1LA4	.79	6BG6G	1.47	7C5	.48	35L6	.52
2C26A	.15	5BP1	2.29	631P1	3.75	918	1.49	FG81A	3.29	1LA6	.89	6BH6	.59	7C7	.59	35W4	.39
2C34/RK34	.22	5BP4	2.39	700A	19.95	919	1.95	FG105A	8.95	1LB4	.89	6BJ6	.57	7E5	.67	35Y4	.49
2C39	17.95	5CP1	1.29	700B	19.95	923	.79	FG172	13.95	1LC5	.69	6C4	.19	7E6	.54	35Z3	.57
2C40	4.95	5CP7	2.95	700C	19.95	927	1.25	FG190	12.95	1LC6	.79	6C5	.47	7E7	.62	35Z4	.44
2C43	7.95	5D21	24.45	700D	19.95	930	.98	GL146	9.95	1LD5	.79	6C6	.57	7F7	.59	35Z5	.39
2C44	.98	5FP7	1.19	701A	3.95	931A	2.98	GL434A	2.69	1LE3	.69	6C8G	.69	7H7	.59	36	.67
2C46	6.95	5GP1	2.98	702A	2.69	954	.16	GL471A	2.85	1L5	.79	6D6	.44	7K7	.89	37	.35
2C51	5.95	5JP1	35.50	703A	1.89	955	.25	GL562	89.50	1LH4	.79	6D8G	.79	7L7	.69	38	.37
2D21	.89	5JP2	8.95	704A	1.49	956	.25	GL697	69.50	1LN5	.67	6E5	.69	7N7	.67	39/44	.27
2D29	1.39	5JP4	39.50	705A	.69	957	.22	HF100	6.95	1N5GT	.59	6F5	.47	7Q7	.59	41	.49
2E22	1.19	5J23	12.95	706B	18.95	958	.22	HF125A	14.95	1P5GT	.67	6F6	.57	7R7	.69	42	.49
2E26	3.39	5J29	12.95	706CY	18.75	959	.35	HF200	14.95	1Q5GT	.67	6F6GT	.57	7V7	.87	43	.49
2E30	2.39	5J30	47.50	706FY	47.50	991/NE16	.24	HF300	17.45	1R4	.59	6F7	.69	7W7	.79	45	.52
2J21A	7.95	5LP1	12.95	706GY	47.50	1613	.49	HY1149	.69	1R5	.69	6F8G	.47	7X7	.79	45Z3	.57
2J22	7.95	5MP1	9.95	707B	14.95	1614	1.35	HY115	.59	1S4	.59	6G6G	.69	7Y4	.47	45Z5	.55
2J26	6.95	5NP1	4.98	708A	3.59	1616	.49	HY615	.19	1S5	.49	6H6	.39	7Z4	.57	46	.62
2J27	12.75	6C21	19.69	713A	.79	1619	.17	KU610	6.95	1T4	.53	6H6GT	.37	12A	.57	47	.69
2J30	49.50	6F4	5.59	714AY	3.59	1624	.67	KU627	6.95	1T5GT	.69	6J5	.47	12A6	.17	49	.85
2J31	8.49	6J4	4.49	715A	5.49	1625	.19	KC4/ML100	37.50	1U4	.59	6J5GT	.39	12A7	.89	50	1.39
2J32	12.95	7BP7	9.95	715B	6.59	1626	.25	ML101	49.50	1V	.57	6J6	.77	12A8GT	.49	50A5	.69
2J33	18.75	9GP7	8.95	715C	19.95	1629	.19	MX408U	.39	2A3	.87	6J7	.67	12AH7GT	.80	50B5	.53
2J34	18.95	9JP1	6.95	717A	.49	1630	.49	REL21	.98	2A4G	1.07	6J7GT	.65	12AT6	.44	50L6GT	.52
2J36	97.50	9LP1	19.95	721A	1.98	1631	.98	RK59	1.69	2A5	.69	6K5GT	.79	12AT7	.79	50Y6	.57
2J37	12.95	9LP7	1.98	723A/B	12.95	1632	.69	RK60	.42	2A6	.79	6K6GT	.44	12AU6	.57	53	.87
2J38	11.95	10BP4	19.69	724A/B	2.95	1633	.79	RK65	24.50	2A7	.79	6K7	.49	12AU7	.67	56	.45
2J39	19.95	10Y	.19	725A	6.45	1634	.98	RK72	.59	2V3G	.69	6K8	.79	12AV6	.54	57	.45
2J40	24.50	12DP7	14.95	726A	6.75	1635	1.09	RK71	.59	2X2	.37	6L5GT	.79	12BA6	.55	58	.49
2J46	49.50	12GP7	12.75	726B	29.50	1636	1.98	RX21	2.39	2X2A	.65	6L6	1.05	12BE6	.49	59	.89
2J48	12.75	12HP7	13.95	726C	49.50	1638	.65	RX120	8.95	3A4	.34	6L6G	.99	12C8	.34	70L7	.99
2J49	39.50	12LP4	24.95	730A	9.95	1644	.98	V70D	7.35	3A5	.79	6L6GA	.85	12F5GT	.58	71A	.59
2J50	22.50	15E	1.19	750TL	69.50	1654	2.45	VCR138	5.95	3A8	1.59	6L7	.79	12H6	.27	75	.53
2J54B	22.50	15R	.49	800	1.49	1665	1.10	VR53	.19	3B7/1291	.29	6L7G	.87	12J5GT	.34	76	.44
2J55	69.50	16AP4	49.50	801A	.19	1851	.69	VR78	.29	3D6/1299	.29	6N7	.75	12J7GT	.67	77	.43
2J61	34.50	19T8	.89	802	4.19	1960	.89	VT127A	2.19	3LF4	.79	6Q7	.64	12K7GT	.52	78	.44
2J62	34.50	23D4	.29	803	2.95	2050	1.19	VT158	14.95	3Q4	.47	6R7	.79	12K8	.59	80	.37
2K25	22.50	28D7	.29	804	7.95	2051	.39	VU111	.49	3Q5GT	.67	6S7G	.79	12Q7	.49	81	1.25
2K28	24.95	30 SP	.19	805	3.65	8005	4.75	WL468	5.95	3S4	.57	6S8GT	.77	12SA7	.57	82	.84
2K29	24.50	35TG	5.95	807	1.09	8011	.25	WL530	12.75	3V4	.67	6SA7	.44	12SC7	.58	83	.75
3AP1	4.59	45 SP	.19	808	.99	8012	1.39	WL531	4.75	5R4GY	109	6SC7	.59	12SF5	.59	83V	.89
3B22	1.98	53A	5.95	809/3C30	1.89	8013	1.39	WL532	1.89	5T4	.87	6SD7GT	.44	12SF7	.54	84/6Z4	.56
3B24	1.49	75TL	5.95	810	7.95	8014	22.50	WL616	37.50	5U4G	.49	6SF5	.49	12SG7	.52	85	.69
3B25	4.47	100R	.97	811	1.98	8020	.89	WL619	18.95	5V4G	.87	6SF7	.59	12SH7	.35	89Y	.35
3B26	1.49	100TH	9.95	812	2.45	8025	3.69	WL677	34.50	5W4	.67	6SG7	.59	12SJ7	.47	117L7/M7	1.19
3B27	1.95	100TS	2.25	812H	6.36	9001	.32	WL681/686	22.50	5X4G	.57	6SH7	.37	12SK7	.57	117N7	1.19
3B28	7.95	211	.25	813	6.85	9002	.25	WL710A	.25	5Y3GT	.39	6SJ7	.47	12SL7	.59	117P7	1.19
3BP1	2.39	217C	9.95	814	1.98	9003	.33	0A2	1.29	5Y4G	.49	6SK7GT	.44	12SN7	.52	117Z3	.49
										5Z3	.52	6SL7GT	.59	12SQ7	.49	117Z6	.65

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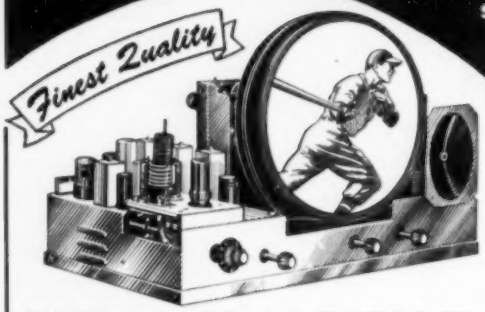

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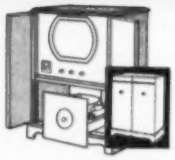

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Improves installations: saves ½ the work. *Model FSM-1,* complete with tubes ..... Net **$79.00**

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Supplies 5-8 volts at 10 amperes continuous, 15 amps. intermittent. Step voltage control, ripple less than 3%! Power on instantly—no warm up period required. For 115 VAC-50/60 cycles.

HERE'S WHAT YOU GET:

- Heavy duty power transformer
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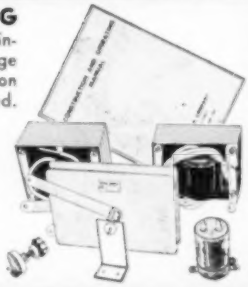

Kit #EL-2

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Serviceman's net.

Complete with operating and instruction manual. Shpg. wt. 24 lbs. Sorry no COD's.

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the April 12th meeting of the Fort Monmouth Chapter and was followed by Col. W. F. Atwell's outline of the second day of the annual convention at Fort Monmouth on May 13th.

Colonel Dixon talked on the over-all membership and the need of additional group members in the association. This retired officer, who formed a chapter while stationed in Brazil and is a former president of the New York Chapter, emphasized the importance of the chapter president to an organization, as he together with the executive committee and other committee chairmen are responsible for the activities of a successful chapter. Colonel Dixon also stated that a representative of the office of the Chief Signal Officer is now touring the ROTC in the midwest and southern areas where he will speak on the AFCA at sixteen universities to the Signal Corps ROTC. It is hoped that several additional student chapters may be formed in the near future.

Colonel Atwell then briefed the group on the itinerary scheduled May 13th for the AFCA annual convention at Fort Monmouth. Included among the outstanding items on the day's program will be the 82nd Airborne Division with a radio team parachuting to earth and describing its sinking sensations; laying telephone wire under combat conditions; lunch in a Post mess hall; exhibits and a parade.

Entertainment by the Post Special Services and refreshments followed the meeting.

Boston

The newly activated Boston Chapter, AFCA, met at the Boston Naval Shipyard, Charlestown, on the evening of April 27th. Rear Admiral T. F. Halloran, USN (ret.), *General Communication Company,* who has been acting as chairman of the committee working toward the rehabilitation of the chapter, presided at the meeting. In his opening remarks he explained to the members and others who had come to the meeting because of interest in the association, what the plans were for the local chapter and why Boston should be represented in the association as one of the outstanding chapters. Admiral Halloran gave much credit to his working committee for getting the crowd out to this first meeting, and then called on Colonel George P. Dixon, AFCA national executive secretary, to tell something about the national setup of AFCA and its objectives.

The next item of business was the election of officers and the following names were submitted by Raymond B. Meader of the *New England Tel & Tel Co.,* chairman of the nominating committee, and upon motion duly made were elected: President—T. F. Halloran; Vice Presidents—Myron D. Chase, *New England Tel & Tel Co.* and Paul Hannah, *Raytheon Company;* Secretary—Major James E. Foster, Asst. PMS&T, Massachusetts Institute of Technology; Treasurer—Gardiner

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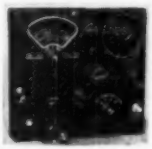
Like new at only **$1.29**



Portable VHF Communication Unit

Two-way radio telephone equipment designed for operation between 152 and 162 megacycles. Adaptable for many uses, a complete unit including the rechargeable storage battery weighs but fifteen pounds, and is housed in a sturdy case 11½"x 9"x4¼", provided with shoulder straps.
This brand new set of big name manufacture comes complete with battery, battery tray, and handset but less crystal **$89.50**
Battery charger is extra at **$19.95**

Mobile VHF Communication Unit

Adaptable for many mobile uses, this is a compact unit 3½"x8"x15½", operating on 152 to 162 megacycles. It is six volt powered direct from storage battery, and is complete with the tone filter and crystal; handset, control box, antenna and installation kit.
Brand new, ready to go **$129.50**
Extra 18" stub type antennae are available **$2.95**
Extra handsets (cradle type) **$5.95**
Extra control units which house a PM speaker and provide mounting for handset **$4.95**
A combination of both the handset and control box **$9.95**

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Drastically Reduced from 10 to 50% Nationally Advertised Brands

Type	Net Price	Type	Net Price	Type	Net Price
1A4P	$0.24	6N7	$0.34	36	$0.24
1A6	.19	6SF5GT	.34	37	.24
1B5/25S	.24	6S7G	.39	38	.24
1B26	2.25	6S8GT	.89	39/44	.24
1B29	.39	6SG7	.59	40	.39
1B32-632A	2.29	6SF7	.29	50	.39
1C6	.19	6SJ7	.59	56	.24
1C7G	.19	6T7G	.39	57	.24
1D5GP	.24	6U7G	.29	76	.24
1D7G	.19	6Z7G	.39	77	.24
1F4	.24	6ZY5G	.29	78	.24
1F5G	.24	7C4/1203A	.24	79	.29
1H4G	.24	7E5/1201	.39	80	.34
1J6G	.24	10Y/VT26A	.19	371B	.34
1J6GT	.24	12A6	.34	700A	1.95
1P5GT	.24	12A6GT	.34	703A	1.49
1V	.24	12A7	.34	705A	.79
2A6	.39	12A8GT	.19	714AY	6.95
2A7	.24	12F5GT	.29	801A	.39
2C26A	.19	12H6	.29	829	6.95
2V3G	.49	12J5GT	.24	832	4.95
2X2/879	.39	12J7GT	.24	837	1.49
3FP7	.98	12Q7GT	.24	841	.29
4AP10	.98	12SF5	.24	864	.29
5BP4	2.95	12SF5GT	.24	872A	.89
5CP1	2.95	12SF7	.24	954	.19
5D21	9.95	12SH7	.24	955	.34
5FP7	.95	12SR7	.24	957	.34
5J23	8.95	12SR7GT	.29	1625	.29
5T4	.49	12SN7GT	.89	1626	.24
5W4	.49	12Z3	.29	1630	.29
5Z4	.39	16R	.19	1642	.29
6AB7	.59	19	.89	2050	.89
6AJ5	.89	24A	1.95	2051	.49
6B8	.59	28D7	.34	9002	.34
6C4	.39	30SPEC (Vt87)	.69	9003	.39
6D6G	.59			9006	.29
6F6GT	.39	30	.24	GL4A21	.29
6F6G	.59	304TL	1.29	Amperite	
6H6	.29	32L7GT	.39	10T1	.29
6J7GT	.39	33	.24	Jan CRP72	.98
6K6G	.59	34	.24	REL36	.69
6L5G	.39	36/61	.24	VR105	.69
6L7G	.39				

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HS-23 Hi Imp. Headsets	New	$2.95
HS-33 Lo Imp. Headsets	New	2.95
HS-30 Hi Imp. Headsets	New	1.50
	Used	.79
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T-45 (for Navy) Lip Mike	New	.98
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2 mfd. 4000 VDC. OIL FILLED		$2.95
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1 mfd. 6000 VDC. OIL FILLED		1.98
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.4 mfd. 1500 VDC. OIL FILLED		.29
	10 for	2.49
2 mfd. 600 VDC. OIL FILLED		.29
	3 for	1.00
1 mfd. 600 VDC. OIL FILLED		.24
	5 for	1.00
1x.1x.1—1200 VDC. OIL FILLED		.59
	2 for	1.00
50 mmfd—5KV—5 Amp. Vacuum Cond.		1.19

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	Used	New
ID 6/APN 4 Scope, Excellent	$29.50	—
R 7/APS 2 Receiver-Indicator	—	$79.50
R 78/APS-15 Receiver-Indicator	34.50	—
BC 1287 A Scope	75.00	—
ASB 7 Indicator Scope	12.95	—
SCR 522 Transceiver 100 to 150 MC	34.95	75.00
BC 1206 Receiver, 200 to 400 KC	3.95	5.95
MN 26 C	17.50	24.95
RA 10 DA Receiver	17.50	24.95
RT7/APN1 Transceiver	4.95	9.95
APN 1 Complete	—	24.50
BD 71 6 Pos. Switchboard	9.95	12.95
EE 8 Field Phones	7.95	—
BC 347 Interphone Amplifier	—	2.95
I-70 Tuning Meter	—	.89
AM 61 Indicator Amplifier	—	9.50
SCR 625 Mine Detector	—	39.50
BC 461 Veeder Root Counter	—	.59
BC 442 Less Condenser	1.49	1.95
APS 13 UHF Antenna, Pair	—	.98
FL 8 Filter	—	2.95
I-97 Bias Meter	$4.95	3.95
HM 23 Remote Telephone Control	7.95	9.95
BC 602 Control Box	—	.98

One Tube Interphone Amplifier—Small compact aluminum case fully enclosed. 2¼"x3¾"x5¾". Less Tube 79c
BC 717 Transmitter, New but less Tubes $24.50
96Q1 Complete Autotune assembly with motor and frame as used in **ARC-1** Transmitter. New $35.00
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BC 1291—Control box contains motor rheostat control rated 10 ohms at 3.88 amps. Brand new with cord and plug-in ventilated, mounted case $1.95
MC 38SA—Headset Adapter ..... New 45c

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BC 639 Receiver with **RA 42** Rectifier
RTA 1B Transceiver
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SCR 584 Components
R-132, TPS 10 Radar Receiver
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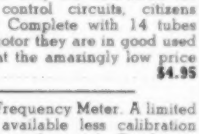

LM Navy Frequency Meter. A limited supply is available less calibration book, tubes and crystal. Good condition ..... **$12.95** ea.

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AS-138/ARN—10 inch streamline loop as used with direction finding receivers. Fixed position, it is ideal for planes, boats, automobiles. New **$1.95**

SOLENOID 110V/60 cycle coil complete with trip arms that really snap into place and hold. New 49c

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	Used	New
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BC-454	4.95	$6.95
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Complete Command set as removed from aircraft—3 receivers—2 transmitters—Relay unit—control boxes—mounting racks—plugs—modulator and dynamotors—crated Set **$34.50**

T39-APQ9—Less tubes ..... Used **$7.95**

BC-605 Interphone Amplifier

Easily converted to an ideal intercommunication set for office—home—or factory.
Original—New $4.95
Like New 2.95
(With Schematic)
See April 1950 Radio News for complete conversion data.
All necessary parts and instructions to convert the above to AC operation with one remote station $8.25 additional.

BC-604 Transmitter FM 20-28 MC

11 and 15 meters. Can be operated on 10 meters—10 channel push button crystal. With all tubes and meter but less dynamotor. Excellent Condition **$12.95**
Crystals—Set of 80 ..... **14.95**

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Receiver-Transmitter—2 crystal channels—20 to 27.8 MC FM—13 tubes. Metered, Plate and Filament ..... New **$14.95**
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PE 97 Power Supply for above 6-12 volt vibrator type.
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FT 250 Mount for both BC 620 and PE 97 New **$1.50**

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Brand new Transmitter with all three tuning units, two tuning unit cases, spare tube carrying case, shock mount and brace; but less tubes at new low price of **$19.95**
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Tuning units are available separately at ..... Ea. **$2.50**
Cases at ..... Ea. **.95**
PE 125—12-volt Vibrator Pack ..... New **$12.95**
Used **6.95**
Spare parts kit for PE 125 containing 2 tubes, 2 vibrators and 13 fuses in metal container with handle and clasp (BX 41) ..... New **$2.95**

All shipments FOB warehouse. 20% Deposit required on all orders. Minimum order accepted—$5.00. Illinois residents, please add regular sales tax to your remittance.

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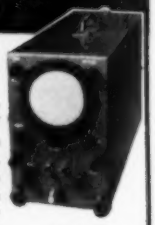

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The vertical response of this economy TV scope is usable to 5000 kc, not 50 kc. Response is flat to 750 kc, down 3 db at 1000 kc. Amplifier supplies a voltage gain of 20 at 5000 kc.

AR-3

Check this necessary feature before you buy any scope for TV use.

The R.S.E., AR-3 Scope has been built by Ross Armstrong to our rigid specifications. It's a complete unit that embodies standard horizontal amplifier and sweep circuits with normal sensitivity.

The case is 8" high x 5" wide x 14" long, attractively finished in "hammered" opalescent blue enamel. Operates on standard 110 volts—60 cycles—40 watts. Tubes, 3BP1-6AC7-6SJ7-6X5-5Y3-884. Instructions included. Complete specifications upon request. Satisfaction or your money back.

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PRICE **$49.95** F. O. B. DETROIT

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AT A PRICE THAT CAN'T BE BEAT

6 tube superhet—3 tube intercom permits communication between radio-master and up to 4 sub-stations.

Original cost $64.50

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With 1 sub-station and 50 feet of cable
Extra Sub-stations $3.95 each

PUSHBACK WIRE

25% BELOW MILL COST!

1st class, Essex or Lonz, ALL SOLID tinned copper, double cotton serve, waxed finish.

SIZE	COLORS	100 feet	1000 feet	Production Reel
22	BLACK-BROWN	.39	3.79	3.65M
20	RED-WHITE-BLUE	.49	4.49	3.95M
18	BROWN	.69	5.98	

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Greene, *Workshop Associates;* National Council Member—Lt. Col. F. H. King, Signal Officer, 67th Fighter Wing, Air National Guard; Members at large for Executive Committee: Raymond B. Meader and Capt. A. R. Taylor, Supervising Inspector of Naval Material.

Following the business meeting the group adjourned to the Officers' Mess at the Naval Shipyard where an excellent dinner was served and an opportunity was afforded for everyone to become better acquainted.

A large delegation from Boston was expected to attend the national convention in New York.

Kentucky

The April meeting of the Kentucky Chapter was held on April 14th at Fort Knox. Through the generous cooperation of the staff of the Armored School, luncheon was held in the Armored School cafeteria at noon, after which there was a bus tour of Fort Knox, including the Gold Depository, the Armored School and the General Patton Museum.

The Communications Department of the Armored School exhibited the very latest communication equipment, some of which was demonstrated during the visit. This school offered a great deal of interesting equipment which has been developed since the close of World War II.

At the close of the tour, the group assembled at the Country Club for dinner and a business meeting. During the meeting a charter was presented by Kentucky Chapter President R. H. McAteer to the new Louisville-Fort Knox Sub-Chapter.

New York

At its meeting on April 19th the New York Chapter concluded arrangements for the AFCA annual convention in New York. Brig. Gen. A. W. Marriner of the *IT&T*, chairman of the convention committee, gave a full report on the preparation for the convention at the Hotel Commodore on May 12th and at Fort Monmouth on May 13th. The New York Chapter will be host at a reception and cocktail party preceding the annual banquet at the Commodore May 12th.

After dinner, Chapter President Thompson H. Mitchell, *RCA Communications*, introduced the guest speaker, Major H. L. Roberts of the Signal Corps Photographic Center. Major Roberts spoke briefly of his various experiences in making motion pictures during the past war. He then showed a new 1950 training film just released, entitled "The Ionosphere and its effect on Radio Propagations." This film consisted of animated cartoons depicting the effects of sky-wave propagations and the ionosphere on long distance radio communications.

Philadelphia

Colonel George W. Goddard, director of photography and research development at the Air Force center,

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3619 TROOST KANSAS CITY, MO.

Wright Field, Ohio, gave a demonstration-lecture on the Air Force's tri-dimensional photography show before a meeting of the Philadelphia Chapter at the Franklin Institute on May 2nd.

Colonel Goddard described a camera capable of taking clear pictures from a low flying airplane going 3000 miles an hour, if such a speed were attainable. The camera uses moving film, doing away with the conventional type of shutter and "makes an exceedingly sharp picture." "On a recent test," he said, "a jet plane at 500 miles an hour flew over a man holding playing cards, passing only 50 feet over his head. The picture was so sharp you could read the ace of spades."

The Air Force officer told of other products of Air Force research, including photoflash bombs for taking pictures from 40,000 feet at night that are "so good it is difficult to tell them from pictures made in daytime." Another new camera detects camouflage by using two layers of film, one an infra-red film that records only natural vegetation, and a second layer that picks up imitations.

Distortion of wide-angle shots is being overcome, he said, by photographing on the inside of a spherical glass plate instead of on flat film. With this, a picture can cover 750 square miles from an altitude of 40,000 feet.

Colonel Goddard revealed the use, in the Okinawa invasion, of a camera that gauges the heights of obstacles on a beach and the depth of water up to 30 feet.

Pittsburgh

Members of the Pittsburgh Chapter were guests at a lecture in the Mellon Institute auditorium on April 17th when Stewart L. Bailey discussed ultra-high frequencies and color television. The meeting was sponsored by the AIEE, IRE, and ESWP.

Sacramento

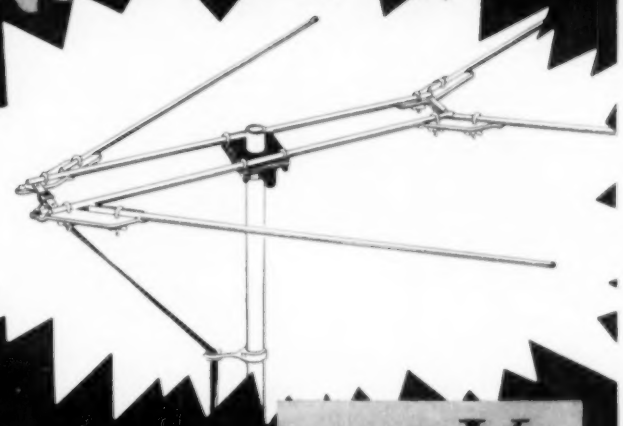
The Sacramento Chapter's April 13th meeting featured an organized tour of three world-wide broadcasting stations located within a few miles of each other in the open country near Dixon, Calif. The party met at The Milk Farm on Route 40 for dinner and then formed into groups for the tour.

The *AT&T* station placed on the air in 1931 is a radio-telephone broadcasting station and is in communication with Trans-Pacific points as well as ships at sea. The station is served by sixteen transmitters of varying powers and has 23 rhombic directional antennas. The method of scrambling and unscrambling messages, which insures privacy of conversation, was described.

The *NBC* station, placed in service in 1942, is the western outlet for the State Department's "Voice of America" covering South America, South Pacific, the Orient and Alaska. The rhombic antennas there are mounted on towers 190 feet in height.

The third station visited was the U. S. Naval Station which was placed in service in 1949. It is strictly a work-

NEW WORKSHOP



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DUBL-VEE TV ANTENNA

Outstanding ALL-CHANNEL *Performance*

THE "end-fire" DUBL-VEE sets a new standard in TV antenna performance. Higher gain, sharper directivity, and closer match assure superlative reception — clearer, steadier, sharper pictures. In fact, a single DUBL-VEE actually outperforms double-stacked models of most other types. Rugged — easy to assemble — economically priced. Your best buy at any price.

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Clearer Pictures — narrow beam cuts down multi-path ghosts

Clearer Pictures—better impedance match on all channels maintains high signal strength

Clearer Pictures — true horizontal polarization—no out-of-phase ghosts

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Specialists in High Frequency Antennas

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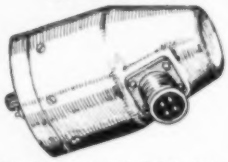

24 Volts D.C. 7 Amp. 1 R.P.M. Reversible. Torque 500 in. lbs. Contains two adjustable limit switches with contacts for position indication. Ideal for use as a remote positioner or beam or television antenna rotator. Will operate on 60 Cy. Complete with instructions. $6.50 Ea. Net

GENERAL ELECTRIC SELSYN
Type 2J1G1

Will operate from 110 volts, 60 cycle by using a resistor or a condenser in series. Size is 2¼" in diameter x 4⅝" long. Ideal for beam antenna position indicator.

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ing station and serves as a back-up station for the more important Naval Center at Mare Island Navy Yard in Vallejo, Calif., in serving the Western World including naval ships at sea and Alaskan ports.

Seattle

An intensive recruiting campaign to increase the Seattle Chapter's membership was launched by Chapter President C. D. Lawrence at the organization's April 12th meeting in the Chamber of Commerce Building.

The chapter's guest of honor was Maj. Gen. Frank E. Stoner, until recently Chief of Communications, United Nations. General Stoner emphasized the importance of friendly relations between the armed forces and industry and stated that the AFCA can achieve this goal in the communications field through the members representing the communications industries.

Admiral C. E. Anderson, guest speaker, entertained the chapter with stories of his many amusing experiences during the war from the time of his first physical examination to the Sands of Iwo Jima.

Mr. Frank D. Keyser of *Pan American Radio* then gave an outline of the demonstration to be presented on radio marine equipment and introduced Maurice F. Kerr, Chief Engineer of *Pan American Radio* and former president of the Seattle Chapter. Mr. Kerr discussed the problems encountered in the cruiser, work boat, and fishing boat classes.

ANNUAL CONVENTION

At the annual convention of AFCA held in New York on May 12th, Theodore S. Gary, vice-president and director of *Associated Telephone and Telegraph Company*, was elected president of the Association, succeeding Frederick R. Lack, vice-president of *Western Electric Company*. Mr. Gary who has long been active in the work of the AFCA, was until his recent election first vice-president of the Association in charge of chapters.

Other officers elected at the annual meeting were: W. W. Watts, vice-president of *RCA Victor*, as first vice-president; Rear Admiral E. E. Stone, until recently Chief of Naval Communications, second vice-president; J. R. Cunningham, *United Air Lines*, third vice-president; C. O. Bickelhaupt, vice-president and secretary of *A. T. & T.*, fourth vice-president; and D. R. Hull, assistant vice-president of *Raytheon Manufacturing Company*, fifth vice-president. —30—

DOWN EAST HAMFEST

THE Portland Amateur Wireless Association, Inc., is holding its second annual Down East Hamfest at the Eastland Hotel in Portland, Maine, on July 29.

Tickets are $3.50 each and include everything from prizes to the ice cream at the end of the banquet. The advance sale of tickets is being handled by Manley W. Haskell, W1VV, 15 Hemlock St., Portland, Maine. —30—

"Premier" Prices on TUBES and PARTS

29c ea. 1S5, 2C26, 2C34, 3A4, 01A, 6A3, 10, 12A, 39/44, 47, 50, 71A, 112A, 182B, 183, 25S, 482B, 483, 1A4, 1A4P, 1A6, 1B5, 1DSGT, 1D7, 1D8GT, 1F4, 1F5G, 1G4GT, 1G4GT, 1H4G, 1H6GT, 1J6G, 1L19, 1G26

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10 high list price tubes over $25.00 list value FREE with each 100 tubes
LIMITED QUANTITY.

39c ea. 1T4, 5Y3GT, 1W4, 35Z5GT, 6C4, 6X5GT, 25Z6GT, 30, 31, 32, 33, 34, 35, 35Z4GT, 36, 37, 38, 46, 57, VT-52, 56, 57, 58, 76, 80, 89, HY-615

49c ea. 1C5, 1C6, 1L4, 1R5, 1U4, 1U5, 2A5, 2A7, 3Q4, 3S4, 3V4, 5W4GT, 5X4G, 5Y4G, 6AB4, 6AC4, 6AC5GT, 6AG5, 6AL6, 6AQ5, 6AQ6, 6AR5, 6AS5, 6AT6, 6AU6, 6A8GT, 6B6, 6BA6, 6BD6, 6BE6, 6BH6, 6BJ6, 6C5, 6C8G, 6D6, 6F5GT, 6F6GT, 6G6, 6H6GT, 6J5GT, 6J7GT, 6K7GT, 6K8GT, 6L5, 6S4, 6SA7GT, 6SC7GT, 6SG7GT, 6SH7, 6SJ7GT, 6SK7GT, 6SQ7GT, 6SR7, 6U6GT, 6U7, 6V6GT, 6W4, 6X4, 12J7GT, 6Z4, 12A8GT, 12AT6, 12AU6, 12AX7, 12BA6, 12BE6, 12BF6, 12F5GT, 12H6, 12J5GT, 12W4GT, 12J7GT, 25X6, 12K7GT, 12K8GT, 12SF5, 12SF7, 12SH7GT, 12SR7GT, 1629 (eye), 24A, 25L6GT, 25W4GT, 26, 27, 35B5, 35C5, 35Z6GT, 50B5, 50C5, 50Y6, 51, 77, 78, 85, 99

79c each 1B3GT, 1X2, 2A3, 2A4, 3Q5, 6A7, 6AK5, 6BQ6GT, 6E5, 6G5, 6L6G, 6SD7GT, 6U5, 32L7GT, 50A5, 70L7GT, 350B, 807

89c each 6B5, 6BN6, 12BN6, 25AC5GT, 25BQ6GT, 117L7GT, 117P7GT

$1.29 ea. 6BG6G, 19BG6G

59c ea. 1C7G, 1LA4, 1LE3, 1Q5GT, 1T5GT, 1V, 5V4, 5Z3, 6AB4G, 6BA7, 6AT6, 6AB8, 6AC7, 6AJ5, 6AK6, 6AL5, 6BA8, 6BE6, 6C6, 6SA7, 6SB7, 6SC7, 6SD7, 6SF5GT, 6SL7GT, 6SN7GT, 6J6, 6K5, 6P5GT, 6R7, 6S8GT, 6SF5GT, 6SJ7, 6SK7, 6SQ7, 6T7G, 6W7G, 6Y6G, 6Z7G, 7A4, 7A6, 7A7, 7B5, 7B6, 7B8, 7C4, 7C6, 7E5, 7E6, 7E7, 7F7, 7G7, 7H7, 7J7, 7L7, 7N7, 7Q7, 7S7, 7T7, 7V7, 7W7, 7Y4, 12A7, 12AT7, 12AU7, 12AV6, 12BA7, 12BF6, 12C8, 12J5, 12Q7GT, 12SA7GT, 12SG7, 12SK7, 12SQ7GT, 12Z3, 20, 35 51, 35L6GT, 40, 41, 42, 43, 50L6GT, 53, 75, 84 6Z4, 117Z3, VR150, XXL, 0Z4, 1A7GT, 1A5GT, 1C5GT, 2B7, 5U4G

69c ea. 1A3, 1ABS, 1H5GT, 1LA6, 1LB4, 1LC5, 1LC6, 1LD5, 1LH4, 1LN5, 1N5GT, 1P5GT, 1S4, 2V3G, 2X2, 3LF4, 4A6G, 6B7, 6BF6, 6J8G, 6S7G, 6SU7GT, 6T8, 12BF6, 14A4, 14A5, 14A7, 14A7F, 14B6, 14B8, 14E6, 14E7, 14H7, 14N7, 14Q7, 14W7, 14X7, 14Y4, 19T8, 25Z5, 35Y4, 35Z3, 45, 50C6, 2050, 2051, 9001, 117Z6GT, XXB

Less than 50 tubes, 5c per tube extra.

Tube prices are for 50 tubes or more—may be assorted. Individually boxed—Standard factory guarantee.

50L6, 35Z5, 12SK7, 12SQ7, 12SA7 — 5 tubes for **$2.39**

1R5, 1S5, 1T4, 3V4 Battery Tube Special — 4 tubes for **$1.69**

7JP4	$9.95	12LP4	$19.95
10BP4	14.95	16AP4	39.50

Miniature tubes 12AT6, 12BA6, 12BE6, 35W4, 50B5 — 5 tubes for **$2.09**

3-Way Portable Tube Kit, 117Z3, 1U5, 3V4, 1R5, 1T4 — all for **$2.19**

3S4, 1T4, 1S6, 1R5 — 4 tubes for **$1.69**

1U4, 3S4, 1S5, 1R5 — 4 tube kit **$1.69**

3Q4, 1T4, 1R5, 1S5 — 4 tube kit **$1.69**

50A5, 35Y4, 14A7, 14B6, 14Q7 — 5 tubes for **$2.95**

SPEAKERS Best Quality Alnico 5 PM

	10 or more Each	Price Each
2½", 3", 4", 5"	95c	$1.05
6"	$1.39	$1.49
8"	2.45	2.69
10"	3.95	4.25
12"	4.95	5.45

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Sound Men and JOBBERS, buy them packed 12 to each carton — **$2.95** ea.

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VERY BEST BRANDS	10 or more Each	Price Each
½ meg. or 1 meg. or 1.10 meg. with switch—long shaft	29c	35c
2 meg. for battery sets—switch, long shaft	29c	35c
½ meg., 1 meg., 1.10 meg. or 2 meg., long shaft, less switch	16c	19c
1000 ohm	16c	19c
4 meg.	16c	19c
5000 ohm	16c	19c
½ meg. with 6" shaft	49c	59c

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Kit of 25 BY-PASS CONDENSERS best assorted brands and sizes — **$1.19**
Kit of 50 BY-PASS CONDENSERS very best, assorted sizes — **1.98**
Kit of 50 MICA CONDENSERS, complete — **1.98**
100 resistors—packed in a box, IRC, etc. Best values only—½ watt, 1 watt, 2 watt — **1.98**

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Standard 100 mil. Each — **79c**

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7 PIN MINIATURE SOCKETS	10 for 49c
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10 or more assorted 5% discount

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10—450 V ea. 29c
10—450 V w. 20-20—25 V ea. 29c
15—450 V ea. 29c
20—450 V ea. 39c
30—450 V ea. 49c
30—450 V w. 20-20—25 V ea. 29c
8-8—450 V ea. 39c
8-8—450 V-50-50 V ea. 39c
8-8-8—450 V 50-50 V ea. 39c
10-10—450 V ea. 43c
20-20—450 V ea. 49c
10-10-10-20—450 V-150-25 V ea. 49c
25-10—450 V ea. 49c
30-20-20—450 V—25 V ea. 49c
30-30—400 V-350 V ea. 39c
30-30-25—400 V-25 V ea. 39c
30-30-20—400 V-25 V ea. 39c

150 Working Volts

8—150 V ea. 15c
8-8—150 V ea. 15c
10—150 V ea. 15c
10-10—150 V ea. 24c
10-10-10—150 V ea. 25c
15—150 V ea. 21c
15—150 V ea. 23c
20—150 V ea. 25c
30—150 V ea. 29c
40—150 V ea. 29c
15-15—150 V ea. 29c
20-10—150 V ea. 29c
20-20—150 V ea. 29c
20-20-20—150 V ea. 39c
20-40—150 V ea. 39c
30-20—150 V ea. 39c
30-30—150 V ea. 39c
35-35—150 V ea. 39c
40-20—150 V ea. 39c
40-30—150 V 30-20-25 V ea. 39c
40-40—150 V ea. 39c
40-40—150 V 20-25 V ea. 39c
50-30—150 V ea. 39c
50-50—150 V ea. 39c
60-60—150 V ea. 39c
20-16-16—150 V Sprague type ea. 39c
25-25—150 V-200-10 V ea. 39c
15-15-40-20—150 V-25 V ea. 39c
20-10-5-10—150 V-25 V ea. 39c
20-20—150 V-25 V ea. 39c
20-20-160-40—150 V-25 V ea. 39c
20-10-15—150 V ea. 39c
30-5-20—150 V ea. 39c
30-10-20—150 V-25 V ea. 39c
30-10-200—150 V-10 V ea. 39c
30-20-20—150 V ea. 39c
30-30-20-20—150 V-25 V ea. 39c
30-10-15-20—150 V-25 V ea. 39c
20-16-16—150 V ea. 39c

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54c

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$2.79 per 100

OUTPUT TRANSFORMERS STANDARD REPLACEMENT

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For 6V6, 6F6, 2Q5, 3Q4, 3S4, 3V4, 41, 42, 6N6, 2A3, 45, 6L6 — **45c** ea.

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100 Condensers assorted in package — **$5.95**

.001	5c	.0005	6c
.002	5c	.00025	
.005	5c	.0005	
.01	600 V. 7c	500 mmf	600 V. MICA
.02	7c	250 mmf	
.05	8c	100 mmf	
.1	9c	50 mmf	

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In lots of 25 or more — each 9a
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400-VOLT BY-PASS CONDENSERS

.05 mfd. — ea. 6c
.1 mfd. — ea. 6c
.25 mfd. — ea. 10c
.5 mfd. — ea. 15c

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Two gang for superhet or TRF — ea. **69c**

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Standard Broadcast Band — ea. **29c**

Standard replacement crystal cartridge. Each — **$1.39**
NYLON LJ CARTRIDGE — $2.59

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- For use with 16GP4, 19AP4, or 16TP4 (rect. glass) tubes.
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ALL NEW . . . the RC-10 FM-AM tuner! Especially suitable for high-fidelity and TV custom installations, superbly designed to meet all FM-AM requirements.

Write for information—or send 50¢ for instructions and schematics.

THE RADIO craftsmen INCORPORATED

Dept. J, 1617 S. Michigan Ave., Chicago 16, Ill.

Volume Expander

(*Continued from page* 51)

developed by the contact bias generated by the 6SR7.

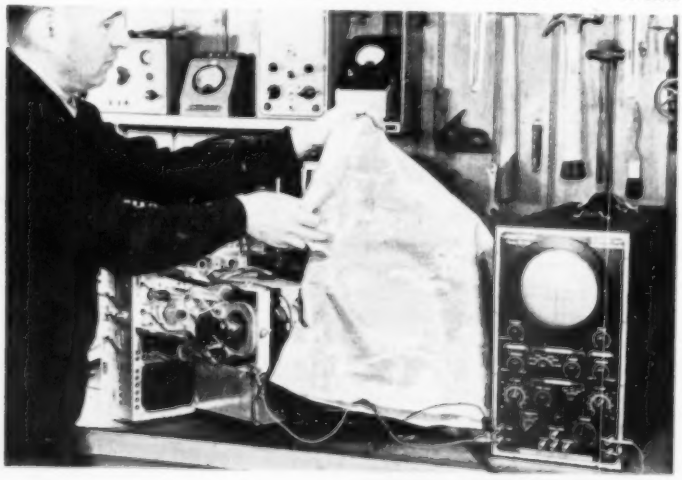
A good quality interstage transformer, such as the *Chicago Transformer* unit used by the author, is recommended for several reasons. First of these is that it provides a convenient method of changing from push-pull output to single-ended input for use with existing equipment. A second reason is that it provides a good means of mixing the asymmetrical signals from the plates of the 6SK7's and likewise prevents the passage of d.c. surges that might tend to block following stages, thus making its inclusion desirable even when a push-pull circuit is used throughout the system. No difficulty from hum pickup was noted in the expander shown, but preferably the interstage transformer should be isolated as well as possible from power and high level output transformers.

The self-contained expander requires an input of between one and two volts and will deliver a maximum output of approximately five volts at the twenty decibel expansion level. The input level required is such that the expander may be operated directly from most crystal pickups or radio tuners, while a preamplifier will be required if it is to be used with a low level magnetic cartridge. It should be noted, however, that for best results a fairly flat input should be applied to the expansion control and some bass attenuation may be required when using a crystal cartridge in order to prevent undue expansion of some low level bass passages. An optional addition to the expander circuit, that may be found useful, is an expansion indicator using a type 6E5 tube, illustrated in Fig. 3. This device provides visual indication of the amount of expansion taking place and may aid in setting the correct level for different recordings. The correct level may be readily determined after a short period of practice.

In closing, some mention should be made of various factors that must be considered by the prospective user before incorporating volume expansion in his system. Other than the listening tastes of the user, perhaps the greatest drawback to a wide dynamic range in reproduction is the noise level of the listening location. If the noise level is high, then the listener will be able to perceive only a limited dynamic range unless recourse to excessively high peak output power is taken. Indeed, under some conditions, such as using classical music for a background in a hotel or restaurant, it may be desirable to introduce volume compression into the reproduction in order to present a fairly constant sound level. Nevertheless, the critical listener with good reproducing equipment and an adequate listening location should find much to recommend the use of volume expansion, not only due to the added dynamic range which tends to give depth to poor recordings, but for the other possible benefits such as scratch reduction, use as a dynamic tone control, to achieve the effect of variable acoustics, or as a means of producing an interesting illusion of audio perspective, as described in an article on three dimensional reproduction in the June 1949 issue of RADIO & TELEVISION NEWS. Similarly, the amateur or public address operator may benefit from the use of some of the principles outlined in this article in the design and construction of high quality limiting amplifiers for communications work.

—30—

To protect picture tube and technician, when a television chassis is propped up on the service bench, simply drape the tube with a piece of old toweling, canvas, or other material. Tuck the cloth over the face of the tube and around the neck so entire glass area is covered.



=COMMUNICATIONS EQUIPMENT COMPANY=

★ SPECIALS ★

ELECTROLYTIC CONDENSERS

D. Y. Type Prong Mount
18c ea. 10 for $1.75

MFD.	VOLT	MFD.	VOLT
40	150	40	250
80	150	30	300
10	200	80	350
8	450	10	450
16	450	15	450
20-20	25	30-30	25
10-10	150	20-10	150
20-20	150	40-20	150
40-40	150	50-30	150
20-30	250	20 {	350
3X20	150	10 {	300

Write for Many Others

29c ea.
10 for $2.75

MFD.	VOLT
6	400
50	400
40	450
30-20	150
50-50	150
20-20	350/25
20-20	400/25
40-20-10	150
40-30/20	150/25
50-50/20	150/25
60-40/10	150/25
60	300
30	450
32	450
30-30	150
70-30	150
30-20	350/25
10-10	450
40-20-20	150
40-30-20	150
3X50	150
40-20 100	150/10

MANY OTHERS

AC CONDENSERS

75-84	125	1.30
20-24	110	1.00
26-30	110	1.00
31-37	110	1.00
38-42	110	1.00
43-48	110	1.00
43-65	110	1.25
50-75	110	1.25
72-87	110	1.25
86-96	110	1.45
88-106	110	1.50
107-129	110	1.75
124-138	110	1.75
130-150	110	1.75
130-180	110	1.90
161-180	110	1.75
158-191	110	2.00

Write for many others

MINICAPS PIGTAIL

Mfd.	Volt	Price
30	450	$0.49
30	300	.45
30	350	.48
40	450	.50
40	525	.70
16	350	.35
16	525	.45
16	450	.40
16	100	.24
20	25	.20
20	80	.25
20	450	.40
24	350	.30
8	400	.30
8	150	.15
10	150	.20
10	50	.15
4	50	.10
4	150	.14

TELEVISION CONDENSER

Mfd	Volt	Price
5000	1.5	$1.20
1000	3	.85
500	6	.45
2000	6	1.35
225	15	.30
800	15	.98
1000	15	.85
500	50	.95
6000	12	2.00
9000	12	4.00

DS Filter Condensers

40-20	335	19c
20	150	19c
2x20	150	29c
2x30	150	29c
40-20	150	39c
2x40	150	39c
30-50	150	39c
2x50	150	39c
3x20	150	39c
3x30	150	39c
50/2x40	25/150	39c
2x40/12	150	39c
2x40/20	150	39c
3x40	150	39c
2x50/20	150/25	39c
2x50/30	150	39c
60-30/150	150/25	39c
80-40-30/100	150/25	39c
40-30	200	39c
20-16-10	200/25	39c
2x32	250	39c
30	350	39c
2x32	350	39c
50-30	350	39c
20	450	49c
16-8	450	49c
2x16	450	55c
32-16	450	55c
2x8/25	450/25	49c
30-20/20	450/25	49c

Many Others

6V Input Dynamotor

Output 150V/75MA or 12V Input, 500V/50MA Out ... $3.40

LAMPS

#1488—14V 10/50c
#623—24-28V 10/50c
#1251—24-28V 10/50c
LM37 13V 10/50c
Red 10W 60V 8c ea.

1619—1619—1619

Octal Base Pentog Aversatile High Perveance Tube. **21c**
5 for Gtd. New $1.00

MICA CAPACITORS SOLAR XMB TAPPED POLES

Mfd.	Price
2500 V Test	
.00001	$0.35
.000025	.35
.00003	.35
.00005	.35
.000075	.35
.0001	.35
.00015	.35
.00025	.35
.0003	.35
.0004	.35
.0005	.40
.00075	.40
.00085	.40
.001	.50
.0015	.50
.0016	.50
.0017	.55
.002	.65
.0023	.65
.003	.75
.004	.95
.005	.95
.006	.98
.0063	.98
.0069	.98
.007	.98
.0075	.98
.0076	.98
.008	1.05
.01	1.25
.015	1.25
.02	1.30
.025	1.30
.027	1.35
.03	1.45
5000 V Test	
.0015	1.75
.002	2.00
Solar XQ Solder Lugs 2500 V Test	
.01	1.25
.015	1.30
.02	1.50
.04	1.75
.001	.60
.0015	.60
.002	.75
.0022	.75
.0023	.75
.0024	.75
.0025	.75
.0027	.80
.003	.80
.004	.85
.005	.90
.0056	.95
.006	.95
.0063	.95
.0075	1.00
.0076	1.00
.008	1.05
.0085	1.20
.0005	.60
.00085	.70
.00015	.60

Write for Many Others

Write for Catalogue of Xfrmrs, Chokes, Cond., Etc.

RF CHOKES

1MHY/125 MA	$0.23
1.9-8MHY	.10
2.5MHY/300MA	.89
3.2MHY	.10
3.3MICHY	.10
3.65MHY	.10
5.2MHY/200MA	.39
5.5MHY/500MA	.98
6.4MHY	.10
10MHY/250MA	.39
20MHY	.18
94MHY	.10
115MHY/150MA	.39

MANY OTHERS

HEAD SETS AND MIKES

Dyn. Mike & Hdset comb: Used in B19 tanks ... $2.75
R15 Hdset: 8000 ohm imp. rubber cushions w/8 ft. cord and PL-55. **NEW** ... $2.95
Head Bands: HB1, HB4, HB30, **NEW**, Ea. ... 25c
Carbon, Xmitter Elements: TS112, TS111, TS13E ... 75c

VARIABLE CERAMICONS

395-475 MMF	20c
170-315 MMF	20c
22-195 MMF	20c
12-145 MMF	20c
15-180 MMF	20c
3-50 MMF	20c
Set of 6 for	$1.00

ANTENNA MAST

Are you in a dead spot? If you can't get a good T. V. Picture here is a sig. Corp. Ant. mast 30' high of rugged plywood construction to solve your problem. It telescopes into 3 ten ft. sect. for easy stowage. Easy to Mnt. Comp. with stakes & rods.
Each ... **$19.95**

SCR-522 100-156 Mc. RECEIVER AND TRANSMITTER

One of the most interesting and useful pieces of surplus equipment. For plane and ground station use, unit offers remote control of any four preselected crystal controlled frequencies in the spectrum of 100-156 Mc. This spectrum covers facsimile, air navigation aids, airport control, railroad, police, urban telephone, as well as the amateur band 144-148 Mc. October 1948 Radio News gives details for converting the SCR-522 receiver section, BC-624. Transmitter section, BC-625, is voice amplitude modulated and has an output of 8-9 watts.

Tubes included: 2—832, 3—12A6, 1—6G6, 2—6SJ7, 1—12J5GT, 3—12SG7, 1—12C8, 1—9002, 3—9003, 1—12AH7GT ... $33.95

ARR2 Homing Receiver

Tubes 234-258 MC. 4—6AK5, 6—9001, 1—12A6. Ideal for 2-6-10 Mtr. Conv. w/Dyn $5.95. Less Dyn. ... $3.95

GIBSON GIRL

The Emergency Radio Transmitter. Sends S O S signals automatically on 500KC, 150-mile range. No batteries required. Has hand-driven generator, tubes, wire. New. It's only ... $3.25

RECEIVER BC-733-D

Localizer receiver of the blind landing system. Companion to the glide path receiver. Also contains 90 and 150 cycle band-pass filters. 108.3 to 110.3 mc. by relay selection of crystals in the local oscillator. Wide pass-band on 6.9 mc IF's ideal for FM. Has a wonderful AVC system using rectified output of an RF oscillator as power supply for 100 volt DC bias. With relays, and 10 tubes: 3—717A, 2—12SG7, 1—12SQ7, 1—12A6, 1—12AH7, 2—12SR7. Condition: Used, excellent.

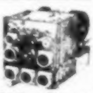
Only ... **$4.95**
w/DYN ... $6.95

SCR610 Mobile FM TRANSCEIVER—Includes 10 meter band. Excellent condition with tubes ... $15.95

PE-120 Power Supply — Less Vibrator Condenser and Tubes ... $5.50

Combination BC-620 and PE-120. Both for ... $20.95

RL 9 or RL 7



Interphone Amplifier Convert to High Fidelity Phone Amp. or Spch. Amp. Compl. w/12A6, 12SL7, 2 Chokes, 1XFRMR, DYN for 24v operation, etc ... $2.75

Navy ARB 4-Band Rec. 195KC to 9 M.C.

For Ships, Planes, Mobile Most Ideal of All Surplus Receivers

You can convert this easily to a good ham receiver. One of the hottest values in surplus receivers 28 volts DC input. Covers 4 bands, 195 kc to 9 mc. A deluxe superhet receiver; frequency coverage includes the standard broadcast band. Has 4 gang tuning condenser, can be converted to a 110 volt AC receiver. Tubes: 12SF7, 12SA7, 3—12SF7 and 12A6. Has dial built on front of chassis. Electric driven or manual band change switch. Weight 28 lbs. Size 6x7x15 inches. ARB with tubes and dynamotor. Used. Fair condition ... $14.95

ARC/5 Transmitters 40 Watt Output These Famous V.F.O. Drivers Available

2.1—3 MC	$5.95
3—4 MC	6.95
7—9.1 MC	6.95

Used. Good cond. w/tubes & XTAL.

ARC/5 RECEIVERS

Sensitivity is 2-6 microvolt. 6 tube Superhets w/12SK7 RF Amp. 12K8 Mixer 12SK7, 1st IF Amp. 12SF7, 2nd IF Amp. 12SR7 Detec. FO. 12A6 Audio Amp. Used. Good condition.

190—550KC	$7.95
1.5—3MC	10.95
3—6 MC	4.95
6—9 MC	5.95
UHF Rec as is condition (Fair)	11.95
UHF Trans as is condition (Fair)	14.95

ARC/5 PARTS

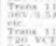
80 Mtr. Xmitr Conv. Kit	$1.50
Fuses, 10A, 3AG	.04
Condenser Kit, 4—3X .05, 1.15 Mfd.	.75
Cond., .05-.01-.05	.19
Cond., 3X .05	.19
Mod. Xfrmr 807 to Parlel 807	1.00
Xmttr. Rack	1.79
Shock Mts. for Rec.	.29
Control Cable	1.19
Modulator, w/Dyn. & Tubes New	7.95
Parasitic Suppressors	.10
Dial Plates, Rec. & Trans. 190-550 Kc.	.10
Plates for Control Box, 190-550, 6-9.1	.10
Kit of 2—5 Mfd. Cond., 1—Choke 5634, 1—Trans. 692327-1, 1—Choke 5546	.98
Control Box Switch	.15
Neon Ind. Bulb	.15
15 Mmf. Trimmer	.15
Relay, 24V Dpdt.	.49
12SK7 Tube	.59
12SR7 Tube	.59
12A6 Tube	.29
12SF7 Tube	.59

PLUGS FOR ARC-5

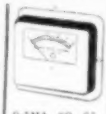
9821—8 Png. Female	.55
6418—8 Png. Male	.30
6577—8 Png. Female	.55
5577—6 Png. Male	.30
PL154A—12 Png. Female	.55
PL154—12 Png. Male	.45
W/15U—16 Png. Female	.55
PL148A—3 Png. Female	.35
7027—18 Png. Male	.30
PL147—2 Png. Female	.50
6967—5 Png. Female	.50
Small—3 Png. Chassis, Female	.10
Large—3 Png. Chassis, Female	.15
Chassis—6 Png. Male	.15
7025—12 Png. Male	.30
FB103442—5 Mfd.	.19
.85 Mfd., 600V	.23
5413—3X .22 Mfd.	.49
10247—.35 Mfd.	.19
7582—.3 Mfd.	.19
3X .05 Mfd.	.19
2933—4X .8 Mfd.	.29
7324—Variable Cond.	.95
7321—Variable Cond.	1.95
5032—Variable Cond.	1.25
6558—Variable Cond.	1.95
5546—Rec. Choke Assy., RF	.49
5634—Rec. Choke Assy., AF	.49
6365—Relay Spst.	.69
MC211A—Right Angle Drive	.50

SPECIAL XFMRS

Trans. 115V/60 cy. Sec. 24V/1.5A. For ARC 5, etc. ... $1.95
Trans. 115V/60 cy. Sec. 36V/3.5A. For Rect., etc. ... $2.75
Trans. 115V/60 cy. Sec. 720 VCT/220 Ma. 6.4/8.7A, 6.4/.6, 5V/3A, 1.25/.3 ... $2.95



XMTR COILS AIR WOUND
80 MTR Bar Prong 100 w. 40 MTR 5 Prong 50w plug-in socket.
160 MTR 5 Prong 50w plug-in socket.
40 MTR 3 Prong Bar 100w.
#C538 2-3.5 MC 300w Fix. Link.
#C390 5-7 MC. 300w Fix. Link.
160 MTR Bar Type 100w.
Each $1.10



0-5MA SQ 2" Metal Case or 0-10 volt movement readrite meter ... 98c

Birtcher Tube Clamps

926C, 926—10, 926—81, 926—82, 926—88, 926B—16, 926A—14, 926C—19, 926A, 926—C1, 926—A11
926C-24, 926—C15, 926—C13, 926B

11c ea. 100 for $10.50 1000 for 10c ea.

BC 645 INTERPHONE AMPLIFIER

Easily converted to an ideal intercommunications set for office—home — or factory. Complete w/conversion diagram for 110V operation.
Brand New ... **$4.49**

Meter Cabinet

For BC221 Freq. Meter. Brand New Wood. 14½H x 10½W x 10D. Value $20.00. Only ... $2.95

VFO FOR BC 221 FREQ. MTR.

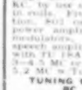
Unit contains two temperature and moisture compensating coils, wafer switch, 3 variable condensers, carbon resistors, and silver mica condensers. FULLY WIRED and mounted on sturdy aluminum sub-chassis, ready for installation. Brand new — in original packing ... $6.95

BC 223 XMITR

30 Watt Transmitter with crystal oscillator control on four pre-selected channels—also master oscillator. Frequency coverage 2000 KC. to 5250 KC. by use of three plug-in coils. Five tube operation, 801 oscillator, 801 power amplifier, two 46 modulators, and one 46 speech amplifier. Price with TU 18A Tuning Unit, 3—4.5 Mc or TU 25 3.5—5.2 Mc w/Tubes ... $22.95

TUNING UNIT FOR BC 223

TU 18A	3-4.5 MC	$2.25
TU 25	3.5-5.2 MC	2.25



Aircraft Rec. or Xmittr (RU GF) for Mobile or Aircraft. Covers 187—13,950 Kcs by interchange plug in tuning units includes one Tuning Unit w/Tubes ... $3.95 ea.

RU/GF (SCR 183) REC. TUNING UNITS

D—Range 850-1330 Kc
E—Range 1330-2040 Kc
F—Range 2.04-3 Mc
G—Range 3-4.5 Mc
H—Range 4-6 Mc
K—Range 9.05-13.5 Mc
Dual Range 400-600 Kc 6-9 Mc

$1.95 EACH

3 For ... $5.00

RU/GF (SCR 183) TRANS TUNING UNITS

1-1.2 Mc	$1.49
1.2-1.5 Mc	1.49
2.2-4 Mc	1.49
5-6.2 Mc	1.49
3 For	$4.00
4-5 Mc w/4495 Kc XTAL	2.95

BC-603 Receiver

10 tube, superhet FM receiver; Foster Seely discriminator, 10 channel pre-tuned, push-button selector; optional manual tuning; adjustable squelch control; speaker mtd. in rec.; freq. range 20 to 27.9 mc. Small change in RF trimmers will cover 10 & 11 meter bands. POWER REQUIREMENTS—Receiver 260-280 v. at .08 amps DC, 14 v. at 3.5 amps. AC.
Price ... $18.95

BC-684 Transmitter
30 Watt 10 Channel Push Button Controlled
27-38 MC. Complete with Tubes
Price $23.95

AUDIO XFRMRS

UTC 80707 ouncer Pl. to Mult. Gds	$1.20
5119—Ouncer Pl. to line	.49
901—Pl. to V. coil	.79
6262—Pl. to Hdst or line	.69
5640—Mike or Line to Grid	1.29
T202—6V6 Pl to 811 Gds.	1.45
T65—Line to Grd.	.98
25—Pl. to Line	.98
837—1:1-1:2 Ratio	.75
622—1:2.28 Ratio	.75
9449 — PP6V6 to PP805 Class B, 10 Watt	$4.95
9446 Hi-Fi 60-15000CPS 250W, Audio 9000—PP to 9 — Voice Coil	$12.95
353 AB1 PP 6L6 to 250 — Line 9 voice coils 20 —, 12 —, 1.7 —, 16 —, 25 watt	$3.95
631 Mike to PP Grids	29c
959 Dyn & Carbon Mike to PP Grids	79c

Line FILTER, GE 100 Amp Filter w/2x5Mfd 50V oil cond. Operates on 110V AC DC ... $1.98

ARC3 complete Audio Modulation XFMR pkg. T103 Carbon Mike to Grid ... $ .95
T102 6J5 to PP 6L6 Grids (Modulation) ... 1.19
T104 Mod. XFMR PP 6L6 to 832 or 8298 Plates ... 1.49

COMPETE KIT OF THREE ... **$2.98**

MOUNTINGS

FT 234A For 274N Trans
FT 232A For 274N Trans
FT 220-A For 274N, BC442
FT 225-A For 274N, BC456
MT 62 For ARC/5, ARR2
MT 78/ARC5 Control Unit
MT 85 ARC5 Junction Box
FT 141 6⅝x4⅝
MT 80 ARC2 Junction Box
MT 65/ARC5
MT 76/ARC5
MT 61/ARC5
MT 69/ARC5
MT 66/ARC5
FT 282A P/o SCR 518A
FT 304A P/o PE110A
MT 167/U SAR
FT 340 P/o SCR 540
FT 265A P/o BC-701
MT 171A/U SAR
MT 7/ARR2 R4/ARR2
MT 5/ARR2 6¾x10⅝

Write for Many Others

XFMR POWER SUPPLY KITS

Trans. 1080V/55Ma 6.3V/1.2A, 6.3/1.2 A, 2-.1 Mfd 2500V 2X2 Tube, Socket, 1-100000 ohm Resis. Price ... $6.95

Trans. 2300V/4Ma, 2.5/2A, 2-.1 Mfd 7500V Pyr. 2X2 Tube, Socket, 1-100000 ohm Resis ... $8.49

Pwr. Supply contains Trans. 600VCT/155 MA, 6.3V/5A, 5V/3A, 2—7 MFD 600V, Dual Choke 10HY 200MA, 5T4 Tube, Socket. Price ... $6.95

Pwr. Supply contains Trans. 820VCT/200 MA, Dual 10HY 200 MA Choke, 2—7MFD 600V, 5T4 Tube, Socket. Price ... $8.95

Contains Xfmr 550-550V 250MA 6.3V/1.5A, 200 Bias, 2—10HY Chokes 2—4MFD 1000V Cond. All for ... $10.95

OIL CONDENSERS FAMOUS MAKES BRAND NEW

Mfd.	Volt	Price
15	220AC	$2.20
.5.5	400	.50
1	600	.45
6	600	.98
7	600	1.05
.5	750AC	1.69
7	800	1.20
.5	1K	.69
1.5	1K	.75
2	1K	.99
4	1K	.98
15	1K	2.20
.25	1.5K	1.05
1	1.5K	.89
1.5	1.5K	.95
2	1.5K	1.05
6	1.5K	2.25
1	2K	.98
.1	2.5K	1.20
.15	4K	2.95
.1.1	4.8K	2.95
.4	5K	2.95
.1	6K	2.79
.15.15	6K	3.95
1.5	6K	9.75
.1.1	7K	3.39
.1	7.5K	2.95
1	7.5K	12.95
.15.15	8K	4.95
.1	10K	14.95
.0016	15K	7.95
1	15K	27.50
.015	16K	6.95
.25	20K	16.95
.5	25K	32.50
1	25K	75.00
4	50	.25
1	100	.15
2.5	100	.23
200VDC		
2x.1	2ST	.15
2x.1	3TT	.15
2x1	4ST	.16
2	2ST	.20
.5	2TT	.15
.5	2ST	.15
400VDC		
2x.25	3ST	.21
2x.1	3ST	.21
2x.1	2TT	.20
3x.1	3ST	.25
.1	2TT	.19
.5	1TT	.19
1	2ST	.23
2	2ST	.26
600VDC		
.1	2HT	.20
.1	2ST	.21
2x.1	3ST	.27
2x.1	3HT	.25
2x.1	2ST	.26
3x.1	3ST	.25
2x.25	3ST	.23
.25	2TT	.20
1	2ST	.30
2x1	3ST	.35
2	2ST	.40
2	2HT	.39
1000VDC		
1	2ST	.45

MANY OTHERS

Xfrmr Specials
9V 1.6A ... $1.60

Pri 110V-80V 60cy Sec 1250V/2Ma, 6V/4A, 650VCT/85, 2.5V/1.75, 5V/3A ... $4.95

T.V. Transformer, 7" or 9" scope, 3000v 5 MA, 720 vct 200 MA, 6.4 8.7A, 6.4 .6A, 5/3A, 1.25/.3A. New ... **$3.95**

RADAR SETS

APS-2	Airborne	10 CM.	Major Units
APS-4	Airborne	3 CM.	Compl.
APS-15	Airborne	3 CM.	Major Units
SD-4	Submarine	200 MC.	Compl.
SE	Shipboard	10 CM.	Compl.
SF-1	Shipboard	10 CM.	Compl.
SJ-1	Submarine	10 CM.	Compl.
SL-1	Shipboard	10 CM.	Compl.
SN	Portable	10 CM.	Compl.
SQ	Portable	10 CM.	Compl.
SO-1	Shipboard	10 CM.	Compl.
SO-8	Shipboard	10 CM.	Major Units
Mark 4	Gunlaying	10 CM.	Compl.
Mark 10	Gunlaying	10 CM.	Compl.

Above—Less Rack New, Less Rack Used

CPN-3	Beacon	800 MC.	Less Ant.
CPN-6	Beacon	3 CM.	Compl.
CPN-8	Beacon	10 CM.	Compl. Less Ant.

SCR-533 IFF AIR 500 MC. Search Tracer
Airborne Radar Altimeter 500 MC. Compl.

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131 Liberty St., New York, N. Y. **Dept. N-7** CHAS. ROSEN **Phone: Digby 9-4124**

NEW *Telecote* Means NEW Life for *Teletower*

Armor-Tough Coating Can't Flake Off!

WITHOUT A PENNY'S INCREASE IN THE *LOW* PRICE, Penn's Teletowers and Thriftowers are now being finished with Telecote—the new, armor-tough coating that can't flake off. Developed by one of America's leading steel makers, the use of Telecote in the television tower field is exclusive with Penn. Telecote is *impervious to weather* . . . protects equipment . . . reduces servicing . . . preserves the sparkling appearance of the tower when new.

Telecote is one of the most important new developments in the whole field of television accessories. Profit-minded dealers will write today for details.

PRICES TO RETAILERS (Shipped prepaid)

THRIFTOWER "30" — Composed of 20' of tower welded as a single unit with 10' 1" O.D. adjustable pole, total approximately 30' overall $24.75

THRIFTOWER "40" — Composed of 20' of tower, same as *Thriftower 30*, with 20' 1" O.D. doubly reinforced adjustable pole giving a total overall extended height of approximately 40' $29.75

PENN *Teletower*
Penn Boiler & Burner Mfg. Corp.
Makers of Penn *Packaged Heat*
ESTABLISHED SINCE 1932
LANCASTER, PA.

V.T.V.M.

(*Continued from page* 45)

However, in most cases observed by the author the change in readings did not amount to more than a few hundredths of a volt on the 0-1.75-volt range. This condition may be checked by the user by simply reversing the d.c. voltage applied to jack J_1 and throwing switch S_1 to "Negative." If desired, separate calibration curves may be plotted for positive and negative input.

After the v.t. voltmeter has been adjusted for d.c. operation, the a.c.-r.f. probe may be connected and an a.c. calibration made. Turn on the instrument, as previously explained, and allow a few minutes for maximum stability to be attained. (1) Set switch S_1 to 1.75. (2) Set S_2 to "Negative." (3) Plug-in the a.c.-r.f. probe by inserting P_1 into SO_1. (4) If milliammeter is deflected from zero, adjust potentiometer R_8 in probe to bring pointer back to zero. (5) Apply carefully measured a.c. or r.f. voltage (variable from 0 to 2 volts r.m.s.) to "High" and "Low" probe input terminals. (6) Set this voltage to various steps between 0.1 volt and full-scale deflection of the meter. (7) Prepare special meter scale or calibration chart showing a.c. volts corresponding to milliammeter readings. A special a.c. scale is imperative for the lowest voltage range. This is because the diode response is not exactly linear at low voltage inputs. However, it will be noticed that the d.c. meter reading will be close to the peak value of the applied a.c. at voltages above about 10 volts r.m.s.

Operation

This v.t. voltmeter may be used for all d.c. measurements between approximately 0.05 volt and 1750 volts in high-resistance as well as low-resistance circuits, while a.c. voltage measurements may be made well into the u.h.f. region.

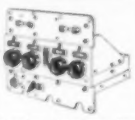
When placing the instrument into operation, always set switch S_1 first to position 1 and pause for a few seconds to allow the filament to heat. Then throw the switch to position 2. But when turning the instrument off, this pause will not be necessary in position 1.

After initial calibration adjustment, the setting of rheostat R_1 ordinarily need not be disturbed until the 1G4/GT-G tube is subsequently replaced.

When checking d.c., filament drain in the instrument is only 50 milliamperes. When the external a.c.-r.f. probe is connected for a.c. measurements, this drain increases to 200 milliamperes. The zero-set cell (B_1) normally supplies about 2 milliamperes, and the plate battery (B_2) approximately 2 milliamperes. The probe bucking cell (B_3) supplies approximately $1\frac{1}{2}$ milliamperes. These low drain levels insure long battery life and infrequent replacements.

RADIO Surplus Buys

TUNER FROM NAVY "BN" EQUIPMENT



Simply modified into 2-meter converter for car or communications receiver. Uses 1-6J6, 1-6SH7, 1-9006, 1-6J5 (not furnished). Slug is tuned from 157 to 187 megacycles. Here's just the unit for that 2-meter receiver. Includes schematic diagram for "BN" equipment.
ONLY .....ea. $6.95

POWER TRANSFORMER
Primary 125 volts tapped at 105 and 115 volts, 50 to 425 cycles. Secondaries: 5.1 v. at 3.0 amps. 325-0-325 v. at 0.175 amp., 5.4 v. at 8 amp., 6.4 v. at 10.3 amp., 2.5 v. at 3.0 amp., 4500 v. at .005 amp., 2.5 v. and 4500 volt windings insulated for 6000 volts. All other windings insulated for 1500 volts. Cost government more than $42.00—a real bargain at $4.95

OIL CAPACITORS
10 MFD @ 600 v.....$ .75
.25 MFD @ 6000 v.....1.50

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OUTSTANDING - TV - VALUES

MODEL #300
Folded dipole complete with reflector and high frequency adapter. Covers 13 channels. All alum. construction. Less mast. Ship. wt. 5 lbs. PRICE $4.10

MODEL #200-D

Stacked array. Consists of 2 complete dipoles and connecting bars. Very rigid construction. Covers all 13 channels. Matches 300 Ohm or 72 Ohm. Center impedance 150 Ohm. Ideal for low signal areas. An outstanding buy. Ship. wt. 8 lbs. SENSATIONAL OFFER at, less mast. $8.25

MODEL #200-S
Single array. Same construction as above. Ship. wt. 4 lbs.
Price, less mast.....$3.75

MODEL #500
All-band folded dipole antenna. Ideal for rotator use. Maximum gain on any channel. A 1 x 6 construction. Less mast. Ship. wt. 5 lbs. Price $4.25

MODEL #Y-100
5 element Yagi Hi-Gain beam designed specifically for fringe area use. All alum. construction. Cut to specific channels. Ship. wt. 12 lbs. Channel #2, $6.50; Channel #9, $6.35; Channel #7, $11; $6.25 and Channel #13, $6.00. The prices are less mast.

ANTENNA ACCESSORIES

CM-100 Chimney Mount.....$ .98
WM-100 2" Wall Bracket.....5.50
WM-100 15" Wall Bracket.....2.75
5-ft. 1½" OD Steel Mast, Plated.....75
5-ft. 1¼" OD Alum. Mast.....1.50
5-ft. 1" OD Alum. Mast.....1.25
3½" 300-ohm standoff insulators (ft cup) cable: Per 100, $2.50; per 500, $10.50; per 1000 19.50
"U" Bolt Assemblies—ideal for mast couplings.....12 for $1.50; 50 for 5.00
Best Quality 300-ohm twin lead: 100, $1.05; 1000 9.00
High Quality 72-ohm Coax Cable: 100, $2.95; 500 13.75
Fold Dipole Hi-Frequency Adapters.....1.35
Stacked Hi-Frequency Adapters.....1.50
Straight Dipole Hi-Frequency Adapters.....1.25

TERMS: All shipments F.O.B. Newark, New Jersey. 25% deposit with orders, balance C.O.D. Minimum order $2.00. Include ample postage.

EAST COAST ELECTRONICS
40 St. Francis Street Newark 5, New Jersey

If the meter deflects backward when checking d.c., indicating that the negative terminal of the test voltage is connected to the high contact of jack J_1, simply throw switch S_2 to its opposite position. *CAUTION:* The instrument case (if connected to "B-minus") is "hot" if the input voltage has such polarity that S_2 must be thrown to "Negative." For this reason, it is advisable to keep the high side of jack J_1 connected to the positive terminal of any high-voltage source being tested.

Whenever completing a.c. or r.f. voltage measurements, remove the external probe from the circuit by removing P_1 from SO_1. This automatically disconnects the 1A3 filament from cell B_4, while simultaneously disconnecting cell B_2 from potentiometer R_8.

When higher voltages than about 175 r.m.s. are to be measured with the a.c.-r.f. probe, it is recommended that a capacitive-type voltage divider be employed at the input terminals of the probe. In this way, it will be possible to extend the a.c. and r.f. ranges of the instrument without exceeding the maximum allowable peak inverse voltage of the 1A3 diode.

An a.c.-r.f. probe requiring no batteries at all may be made around a *Sylvania* 1N34 germanium diode, instead of a tube, and this probe may be connected by means of a phone plug directly into jack J_1. However, the maximum allowable a.c. voltage applied to this probe will be less than that permissible with the tube, because of the lower peak inverse voltage rating of the crystal diode. Several such probes have been described previously in this magazine. —30—

UNIVERSAL TEST KNOB

By NEIL A. JOHNSON, W2OLU

TAKE an ordinary small bar knob and remove the set screw. Next find an 8-32 screw that will fit the hole and leave about ¼ inch extending when screwed onto a ¼ inch shaft. This bolt preferably should have a flat head.

Then find a brass washer, about ½ inch in diameter. File a small flat on one edge of the washer, insert it in the slot of the screw, and sweat the two together. Now, insert the 8-32 screw into the bar knob and you will have a "universal test knob" that can be put onto any ¼ inch shaft and removed easily—in less time than it takes to describe the operation. —30—

"I've been keeping Susie in there while she's ailing, the tubes keep her stomach warm!"

CLEARANCE SALE

DRASTIC PRICE REDUCTIONS ON DOZENS OF SHORT-LOT AND OVERSTOCK ITEMS!

These are real values . . . prices are absolute rock-bottom!

FL-8 FILTER AND "FILTER FACTS" BOOKLET — BRAND NEW! Both for **98c**

TUBES . . .

316A, (WE)	$0.49 ea.,	4 for $1.80
815	1.15 ea.,	4 for 3.95
826	.39 ea.,	4 for 1.40
615, (HY)	.29 ea.,	4 for 1.00
114B, (HY)	.29 ea.,	4 for 1.00
388A, (WE)	.49 ea.,	4 for 1.80
708A, (WE)	.39 ea.,	4 for 1.40
8012	.75 ea.,	4 for 2.80
532	.39 ea.,	4 for 1.40
211		2 for .90
836		2 for 1.10
5MP1	1.25 ea.,	4 for 4.40
20-4 Reg. tube	.15 ea.	
5FP7	1.25 ea.,	4 for 4.40
5DP1A	2.50 ea.	
2X2	.39 ea.	
6K7GT	.30 ea.	
6L6 Metal	.90 ea.,	4 for 3.40
RU-16, 17 Tube sets		$2.85 set
GF-11 Tube sets		2.85 set

HS-16 fones ..... $1.35 ea.
RBS/ARN 5A RECEIVERS. See March Radio-Electronics for converting to FM set. Brand new, orig. boxes. Now only $10.95 ea.

NEW! HIGH-GAIN *Impedance-matching* **PRE-RF STAGE**

Now available, a pre-RF stage of advanced design. Designed to take full advantage of the superior W-E717A tube. Provides a tremendous signal boost to any receiver. Variable input and output circuits, highest stability achieved by excellent shielding and by disc-type, silver-button mica by-passes. Input designed to match 52 ohm to-ax—better signal-to-noise ratio, maximum effectiveness of your antenna! Output couples to any receiver. Available for either 10 or 20 meter band. Please sperify desired band. Aluminum chassis, air, variable tuning capacitors, finest parts. In kit form, cinch to assemble and wire. Punched chassis, all parts and W-E717A tube. (Similar to 6AK5) with instructions. Only $9.95

AN-75-D WHIP ANTENNA

A great buy for you mobile men. 77" collapsible to 14". Has 9 sections—corrosion-proof brass. Sturdy bakelite mount with jiffy wing-nut fastener. Those sold formerly at $2.10 ea.
Now, BRAND NEW, only ..... $1.25 ea.

ALUMINUM CHASSIS

A beautiful little drawn, .025" aluminum chassis, 5¼" long, 3¼" wide, 1¾" deep. Bright-dipped finish. Use for for stages, TV filters, amplifiers, etc.

Only 49c ea.; 3 for . . . $1.35

Power Supply for Any 274-N Receiver

Here it is—at last! Just plug it into the rear of your 274-N RECEIVER . . . any model! Complete kit, and black metal case, with ALL parts and diagrams. Simple and easy to build in a jiffy. Delivers 24 volts plus B voltage. No wiring changes to be made. Designed especially for the 274-N receiver. All necessary parts for conversion of rest of receiver also included. ONLY $7.95. TUNING KNOB for 274-N Receiver, 590 ea.

TRANSFORMERS-CHOKES:

2.5V, 10A. Heavy-duty, 15kv insulation. Suitable for 866, 816, etc. Only a few. Reg. $4.95 reduced to $2.95 ea.
5H, 400ma choke. Fully shielded, drawn steel case. Made by Chicago Transf. Reg. $4.95, reduced to $2.95 ea.
10H, 50 ma choke. Strap mounting. Handy for dozens of applications. Reg. 95c, reduced to 69c ea.

CAPACITORS:

1 mfd, 6000V, oil. GE Pyranol. . . . only $2.00 ea.

MICROPHONES:

Aircraft-type, push-to-talk mic. Button on top. NEW. A real buy! Were $1.15 ea. now reduced to 59c
RCA Hand Mike. Hi-grade, single button. Bronze colored w/cord and plug. NEW. Were $1.95 now reduced to 99c ea.

CODE PRACTICE EQUIPMENT:

Code practice sets. (See former ads.) NEW, original boxes. Formerly $49.50, now $18.95 ea. McElroy Tape Pullers. Variable speed. 115 V motor. Excellent condition, like new. Now . . . . . only $5.95 ea.

TELEPHONE EQUIPMENT:

EE89 Repeaters (see previous ads). Only a few left. NEW! Regularly $9.95 ea. . . now $6.95 ea.
EE8 Field Telephones. Used, good condition. Tested before shipment. Reg. $18.95 pr. Reduced to $10.95 pr.
RM-29A Telephones. BRAND NEW. With TS-13 handsets. Formerly $29.95 pr. Now $17.50 pr. Used handsets, TS-9 and TS-15. Reg. $2.95 ea. Now $1.85 ea.

GF-11 TRANSMITTERS AND ACCESSORIES

GF-11 Transmitters	used $4.95 ea.
GF-11 Plugs	1.50 ea.
GF-11 Coil Sets, any range	1.00 ea.
GF-11 Trans., control box w/plug	2.50 ea.
Extension control box w/plug	2.50 ea.
Dynamotor for RU-GF equip. 28V inp., 400V/185 ma. out	3.00 ea.
GF-11 Dummy Antenna	.98 ea.

FONE PATCH!

Now available, the superior new G.D. 2000B phone patch. Provides you with exactly what you need to patch your phone into transmitter or receiver. Features a hi-impedance input suitable for all mike. Both hi and lo impedance outputs to insure proper match to your particular receiver. Unit is complete—"sure-fire," ready to go to work for you. Only $1.95 ea.

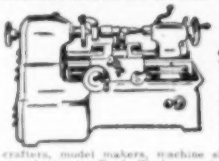
RU-16 RECEIVERS

With conversion sheet.

With 3 coils, used, good condition, only **$4.95**

Coil Drawers for RU-16, 17 receivers. Any range $1.75 ea.
Receiver control box w/plug $2.50 ea.
Tuning meter for RU-16, 17 $2.85 ea.

SMALL PRECISION LATHE—110-V. AC



Now with Larger Motor **$44.50**

A small lathe for radio shops, jewelers, laboratories, dentists, hobbycrafters, model makers, machine shops, schools, etc. Automatic Feed. Work capacity 3" between centers. Swing over bed 2". Constructed of steel and cast iron. Accurately machined and finished. Fan-Cooled Motor mounted inside the base. Complete with 1¼" face plate, 2 lathe centers, tool post and rocker, one lathe dog, one tool-bit and test rod.

COMPLETE ACCESSORY KIT

including 4-jaw chuck, drill chuck, center countersink drill, 2 tool-bits, 2 lathe dogs, 1 face plate with 8 drilled and tapped holes, 4 collets, 1 collet chuck, 1 Allen wrench $24.50

MINIMUM ORDER $2.00. ALL ITEMS SUBJECT TO PRIOR SALE.
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Lowest prices!

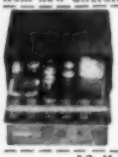
SYNCHRON MOTOR
Model 600, 1 RPM, 115 Volts, 60 cycles. Brand New.
Special Price $2.45 each

C-1 AUTOPILOT SERVO UNIT—

Use to rotate beam antenna, actuate boat rudder control, etc. Contains 24 V. motor, clutch, relays, etc. Reversible. Size overall approx. 10½" x 8½" x 6½". Ideal for light hoisting. Make your own garage door opener. Removed from new aircraft. **PRICE $8.95**

C-1 AUTOPILOT VERTICAL GYROS

May be used to conduct many interesting and amusing experiments. Operates from 24 V. DC or may be operated for short periods on 110 V. AC Gyro will run for approx. 15 minutes after actuating. Size—approx. 8"x8½"x8½". Less Amphenol Connector. Removed from new aircraft. Special **$4.95**



C-1 AUTOPILOT AMPLIFIERS
Three channel servo amplifier consisting of many valuable electronic parts including 6 relays, 7 tubes, etc. Unit removed from new aircraft.
Super Special $4.95

12 V. DYNAMOTOR
WinCo Type 41S6 input 13 Volts DC 13 amps. Total output 250 volts at .060 A and 300 volts .225 A. Ideal for boat or mobile use.
NEW at $3.95 each

BEAM INDICATOR
I-82F Compass Indicator. 0-360°-5 in. dial, 26 v 400 cy. 8-12 v. 60 cy. Ideal position indicator. Brand new.
Price $2.95 each

SAMPSEL PM MOTOR
Alnico Field
27.5 v. DC. 10,000 rpm. 1/100th hp. Ideal also as tachometer generator.
Price $3.95 ea.

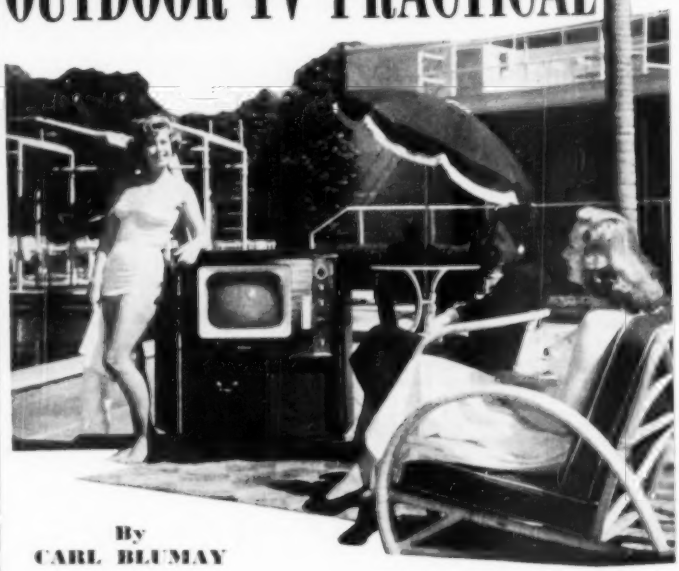
SERVO AMPLIFIER
Minneapolis-Honeywell Design G-403A1
115 v. 400 cy. Use with a.c error signal. Price. $6.50 ea.
USE WITH M.H. MOTOR G303AY2CA4. Built in gear reduction. 50 in lb. torque.
Brand New—Special price $6.75 ea.

Edison Time Delay Relay—s.p.s.t. nor. closed. 30 v. 7 sec. to open. Sealed.....59c ea.
Neon Blown Fuse Indicator—110/220 v. AC or DC.....39c ea.
Relay—6/12 v. DC. D.P.S.T.....69c ea.
Relay—6/12 v. DC. Makes one breaks one. (10 Amps.).....89c ea.
Contactor—Cutler Hammer 6041H30B. (50 Amps.).....Special $2.95 ea.
Tube Specials—7F7, 7N7, 7Y4 at.....49c ea.

TERMS: 20% cash with order—balance C.O.D. Orders accompanied by payment in full must include sufficient postage, otherwise shipment will be made via Railway Express collect. Minimum order $2.00.

Electro Devices
INCORPORATED
BOX NO. 1941 PATERSON, N.J.

NEW TECHNIQUES MAKE OUTDOOR TV PRACTICAL



By
CARL BLUMAY

Outdoor television at the Beverly-Wilshire.

Built-in antennas, black-faced tubes, and new high gain circuits make outdoor televiewing practical.

THE advent of summer has caused most people to "move outdoors"; many of them, in addition to dining and relaxing in the wide open spaces, are moving their television receivers to the porch or patio where they can continue to enjoy their favorites along with the balmy breezes and brilliant sunshine.

Until recently, outdoor televiewing would have been impossible as full enjoyment of the program on the average screen was possible only in darkness or semi-darkness. Today, with the new black-faced picture tubes and improved circuit designs, outdoor viewing has become commonplace.

Efficient built-in antenna systems, along with increased receiver sensitivity, eliminate awkward antenna lead-in wires and make it practical to move the receiver from the living room to the patio, garden, or poolside.

In addition, many sets have the safety glass assembled so that it tilts slightly downward, thus effectively eliminating undue sky reflection in outdoor applications. Some of these safety glasses are slightly tinted which permits an even greater reduction of reflections resulting in sharper and more detailed pictures.

The vogue for outdoor televiewing seemingly originated with a prominent motion picture star who was discussing the possibilities of using his set outdoors with H. L. Hoffman, president of *Hoffman Radio Corporation*, Los Angeles. Since last spring this actor has been enjoying television programs at the side of his pool. The idea soon spread, not only to other members of the Hollywood colony but to some of the swank hotels in the area.

The lush Beverly-Wilshire Hotel in the heart of Beverly Hills has installed a television set near its huge swimming pool, a feature which has gone over big with the guests.

This month's cover was photographed at The Copa Club of the B-W's pool and shows a *Hoffman* Model 947 mahogany receiver with a 16 inch angle screen and a black-faced picture tube. The scene shown has become a familiar one around many pools in sunny climates. Every warm day finds a group of swimming and sunbathing enthusiasts clustered in front of the set watching the programs or listening to the recorded programs available on this combination instrument. The most popular of the *Hoffman* sets, for poolside and outdoor use, has been the unit which combines a three-speed record player, AM and FM radio, and a 16 inch tube television set. —30—

TUBE BARGAINS

1B3 8016 .$.89 715A B .$5.95 RX25 802$3.50
6C4 ..... .41 715C .. 14.50 830B ... 2.90

5R4GY	$1.10	6SN7	$0.49	2021	$1.17
5T4	.75	6SJ7	.52	2J21A	10.95
5U4G	.99	6SK7GT	.49	2K25	23.50
5V4G	.68	6SL7GT	.64	2D5F	4.50
5W4	.72	6SN7GT	.69	2E1A	10.95
5X4G	.63	6SQ7	.50	303A	4.95
5Y3GT	.42	6SS7	.55	307A	9.50
5Z3	.69	6SU7 GTY	1.25	316A	.49
6A7	.74	6V6	.94	4-65A	14.10
6AC7	.79	6V6GT	.65	4-125A	25.95
6AG5	.74	6W4	.69	6L5G2	1.95
6AG7	1.03	6Y6G	.69	703A	1.95
6AK5	.65	7C5	.53	707B	10.95
6AK6	.62	7F7	.94	715B	9.95
6AL5	.62	7N7	.73	715C	24.50
6AQ5	.84	7Z4	.62	721AB	11.95
6AT6	.46	12A6	.21	725A	8.95
6AU6	.62	12AT6	.49	803	4.50
6BA6	.94	12AT7	.62	804	12.95
6BE6	.84	12AU6	.60	808	5.95
6BA8	.99	12AU7	.70	807	1.75
6BE6	.57	12BA6	.89	809	2.25
6BG6G	1.49	12BE6	.73	810	6.95
6BH6	.62	12SA7	.60	811	1.95
6C4	.25	12SK7	.60	813	7.25
6C5	.49	12SQ7	.58	814	3.95
6C6	.62	25L6GT	.60	815	1.51
6C6G	.59	25Z5	.49	816	1.05
6D6	.49	35W4	.45	826	.49
6F5	.62	35Z5GT	.47	829B	7.95
6F6	.62	50B5	.58	832A	4.95
6F8G	.79	50L6GT	.58	836A	1.75
6H6	.42	80	.49	837	2.45
6J4	4.55	83	.79	845W	4.85
6J5	.49	117L7	1.29	866A	2.15
6J6	.99	0A2	1.55	872A	1.25
6J7	.72	0B2	1.76	892R	290.00
6K6GT	.49	VR75	.69	1625	.29
6K7	.83	VR90	.95	2050	1.20
6K8	.85	VR105	.89	2051	.85
6L6	2.19	VR150	.89	5023	3.60
6N7	.79	1N21	.55	9001	.39
6SA7	.50	1N23	.85	9002	.30
6SC7	.64	1N34	.80	9003	.40
6SF5	.53	1N35	2.05	9004	.29
6SG7	.64	2C40	4.95	9005	1.40

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8 HY 50 MA 90 OHM	$0.39
10 HY 80 MA 240 OHM	.89
20 HY 110 MA Sub Sig Horn Seal	3.45
10 HY 150 MA 140 OHM	1.39
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7 HY 200 MA 100 OHM Herm Seal	2.49
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SQ 2¼" O-9 VDC ..... $ .99
SQ 2¼" O-100 AMP DC with shunt ... .99
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0-50 ua DC	$12.50	0-30 AMP AC WH	$5.95
0-200 ua DC WH	10.25	0-75 AMP AC Trip	5.95
0-500 ua GE	6.95	JHT 31-F FH MTR	7.95
0-1 MA DC	5.95		

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0-1 MA DC S Scale	3.95	0-500 ua SP Scale	$ 3.95
0-2 MA DC WH	4.95	0-1 MA DC 500	3.95
0-2 MA DC Simp	3.95	0-1 MA DC Sub	2.95
0-5 MA SP Scale	2.95	0-1.2 MA 500	3.45
0-15 MA DC GE SQ	3.95	0-5 MA SP Scale SQ	2.49
0-20 MA DC WH	3.95	0-5 MA GE AMP Scale	2.49
0-30 MA DC GE	4.50	0-10 MA WH	2.49
0-50 MA DC WH	4.50	0-20 MA SP Scale	2.49
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0-2 AMP DC Simp	5.95	0-50 AMP DC GE	3.50
0-300 VDC Sub	7.95	0-10 VAC GE	3.50
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10+5 DB WES 201	8.95	0-2 AMP RF SQ	3.50
0-150 VAC WH	5.95	0-4 AMP RF GE	3.50
0-30 AMP AC Trip	5.95	0-9 AMP RF WH	3.50
0-200 ua 4" SQ. Volt, Mil, Ohm scale			7.95
0-500 ua 4" SQ. Volt, Mil, Ohm scale			6.95

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7 MF 330 VAC	$0.95	4 MF 1.5 KV DC	$2.49
.5 MF 600 VDC	.49	6 MF 1.5 KV DC	2.95
2 MF 600 VDC	.59	.1 MF 2000 VDC	1.79
4 MF 600 VDC	.79	.25 MF 2000 VDC	.99
6 MF 600 VDC	.89	1 MF 2000 VDC	1.25
10 MF 600 VDC	.95	2 MF 2000 VDC	2.45
1 MF 1KV WAX	.29	4 MF 2000 VDC	3.95
1 MF 1000 VDC	.90	8 MF 2000 VDC	9.95
5 MF 1000 VDC	1.79	.25 MF 3000 VDC	1.45
10 MF 1KV DC	2.49	4 MF 3000 VDC	6.95
15 MF 1KV DC	2.95	1 MF 4000 VDC	2.75
.5 MF 1.5 KV DC	1.25	2 MF 5000 VDC	6.95
2 MF 1.5 KV DC	1.45	.1 MF 7500 VDC	.79

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2.5 VCT 10 A, 10KV Insulation	$3.95
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6.3 V 1.2 A	.65
6.3 V 3 Amps	1.95
6.3 V 12 Amps	1.75
6.3 V 3 Amps, 6.3V 3 Amps	3.40
6.3 V 3.5 A, 2 x 2.5 V 6 Amps ea	3.49
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Proven higher sensitivity than any TV set regardless of make, model or price. Incorporates 13 channel RF stage and CONTINUOUS tuner plus complete PILOT FM BA-DIO, 4 stages of VIDEO IF, GLARE BAN CR tube, and AGC.

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RCA 630 CHASSIS—Standard turret tuner, voltage doubler, plastic capacitors. Gated A.G.C. For 16" or 20" CRT operation.
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650 VCT 850 MA, 5V 4A	2.95
800 VCT 200 MA, 6.3V 4A, 5V 3A	6.50
800 VCT 300 MA, 6.3V 10A, 6.3V 3A, 5V 3A	8.50
1000 VCT 300 MA, 6.3V 10.5A, 5V 6A, 5V 3A	8.50
300 V 100 MA, 22V VCT 100 MA, 6.3V 3.5A, 2.5V 10A	2.49

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APN-1 altimeter transceiver, NEW	$10.50
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BRD ARN 5 receiver, with tubes, NEW	10.50
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TUNABLE CAVITY OSCILLATOR, 440 tube, NEW	17.50
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WESTON 630—IF low range ohm meter, NEW	17.50
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ALLEN-BRADLEY 110VAC, DPST contactor	4.95
100 KC precision crystal	5.95
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JOHNSON 211, 50W output	1.50
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VEEDER Root 2 digit counter	1.10
.002 MF 800 VDC pigtail mica	10 for 1.20
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JACK COVERS BLACK CRACKLE	10 for 1.50
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AIRCRAFT AM TRANSMITTER 6x6x6, complete with tubes, xtal (210SKC), control head, built in 12 VDC supply, antenna loading coil, 8 watts output. NEW **$30.00**

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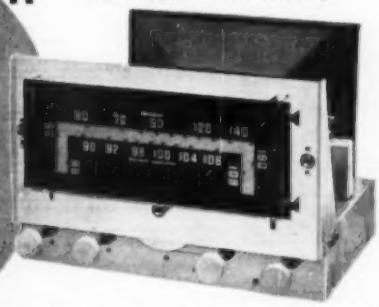
AMERICA'S GREATEST RADIO VALUE!

MEISSNER takes great pride in announcing their new 9A AM-FM chassis complete with Audio. The 9A brings real "Custom" quality reception into the low price field! ¶ A complete AM-FM unit — the 9A is a tuner, amplifier and power supply — everything you need for a deluxe custom installation or for converting older radios. ¶ Nine tubes, including rectifier, give the 9A ample power while a high degree of stability and selectivity is attained through superior MEISSNER circuit design and the use of high quality components. ¶ MEISSNER engineers stress that only a high quality speaker is capable of reproducing the wide range fidelity and tonal richness inherent in the 9A. ¶ See this fine instrument at your dealer's now. Examine the workmanship — hear the glorious richness of its tone! Compare the MEISSNER 9A with units selling for twice its price. You will agree, it's MEISSNER — For Magnificent Reception!



Here's the outstanding 9A — complete with tubes, power supply, built-in antenna, escutcheon, knobs, etc.

features that place the 9A in a class by itself

- High Selectivity and Sensitivity
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- Separate AM and FM Condenser Sections
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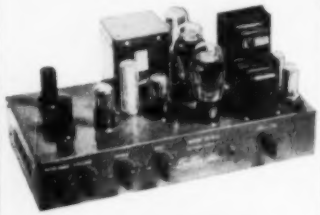
MEISSNER MFG. DIVISION, MAGUIRE INDUSTRIES, Inc., MT. CARMEL, ILLINOIS

ANNOUNCING



2 NEW MODELS

Of Sun Radio's Famous All-Triode Amplifier

The renowned Sun Amplifier Model CR-10 is now offered in three models, the two new ones featuring the famous Peerless transformers. New models are approved by Consumers' Research, original designers. Here's more good news -- for the first time in many months this much wanted amplifier is available for immediate delivery on all models. And prices are scheduled to go up September 1st, so better buy yours now . . .

CR-10, standard model, as engineered to original design by CONSUMERS' RESEARCH OF WASHINGTON, N. J.

Kit $42.50

Lab wired, tested, ready to use . . $69.50

CR-10-P uses Peerless transformers throughout, including output transformer designed especially for this amplifier. Improved low frequency response adds "presence" to reproduction.

Kit $45.95

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CR-10-Q using Peerless transformers throughout, features famous Peerless S-240-Q Output Transformer for real presence effect. Note these specs:

Frequency Response ±1db, 20-20,000 cps.
Less than 2% Harmonic Distortion at 10W output.
Source impedance at 4 ohm tap is 1.3 ohms -- this provides excellent damping of loudspeakers.
Delivers full power within 1db from 40 to 10,000 cycles.
Output transformer vacuum impregnated, moisture resistant.
Output impedances available for any load 2 ohms to 16 ohms, (500 ohms available on special order at no extra cost).
Transformer has split windings interleaved with secondary, making for extremely high efficiency and low losses.

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Lab wired, tested, ready to use . . $84.00

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MAIL ORDERS FILLED PROMPTLY

A. Reiter receives the first degree in Audio Engineering from Dr. H. M. Tremaine as Dr. B. M. Klekner, Hollywood U.'s president, witnesses the ceremony.

First Degrees Granted In Audio Engineering

ON MAY 18, 1950, the *University of Hollywood*, of Hollywood, California, conferred the first Bachelor of Science degree in Audio Engineering that has ever been granted by any university or college. The College of Audio Engineering of the University has raised the standards of Audio Engineering, placing it in a professional classification. Now Audio Engineering is recognized academically as being an engineering profession.

Dr. George K. Teffeau, Dean of the University, officiated at the first commencement exercises, conferring Bachelor of Science degrees in Audio Engineering to twenty-three graduates of the University. To Mr. Abraham Reiter goes the distinction and honor of receiving the first Bachelor of Science degree in Audio Engineering. He previously received a Bachelor's degree in Mechanical Engineering from *Cooper Union*, New York City, and was awarded a certificate for outstanding work by the student branch of the *American Society of Mechanical Engineers*.

Hilliard, Read, da Costa and Browne Honored

The colorful graduation ceremonies were concluded with a banquet and the presentation of honorary degrees. Mr. John K. Hilliard, Chief Engineer of *Altec Lansing Corporation* and a recognized authority in the radio, motion picture, and sound industries for many years, received the honorary degree of Doctor of Science in Audio Engineering. Mr. Hilliard was honored in recognition of the contributions he has made to the science of audio and film engineering.

Prior to his association with *Altec Lansing Corporation*, Mr. Hilliard was an engineer in the Sound Department at *Metro-Goldwyn-Mayer Studios*. He actively participates in the activities of various engineering societies such as the Institute of Radio Engineers, the Audio Engineering Society, the Society of Motion Picture and Television Engineers (Fellow), and is vice-chairman of the Z-57 Group of the American Standards Association.

An honorary degree of Doctor of Science in Audio Engineering was also conferred on Mr. Oliver Read, Editor of RADIO & TELEVISION NEWS and RADIO-ELECTRONIC ENGINEERING. This honor was given Mr. Read "because of the valuable contributions he has made to the science of audio engineering in his capacity as an editor, and furthermore, in recognition of his recent authoritative literary contribution as the author of the book entitled, "The Recording and Reproduction of Sound" and many articles on audio subjects.

An honorary degree of Doctor of

Dr. Hilliard

Dr. Read

Dr. da Costa

Dr. Browne

WALSCO ANNOUNCES

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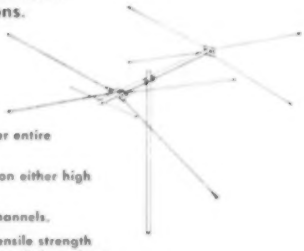
SIGNAL KING ANTENNA

FINALLY, the one antenna that does more to *guarantee* outstanding reception, trouble-free performance in even the fringe areas. The WALSCO Signal King, with its amazing new patented design, assures longer, dependable service under the most adverse weather conditions.



- Broad response over entire TV spectrum.
- No weak channels on either high or low band.
- Extra gain on all channels.
- Marine type high tensile strength aluminum alloy used throughout on elements, cross-arms and masts.
- Elements are reinforced with metal insert and are sealed on outer end.
- Full 1 inch O.D. cross-arm.
- U-bolt assembly fits mast from ¾" to 1½" O.D. Bracket made of serrated steel that bites into the mast. All cadmium plated.

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OFFERING YOU THE PERFORMANCE OF AN ELECTRIC ROTOR AT ONLY A FRACTION OF ITS COST

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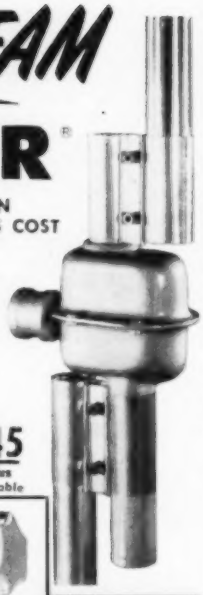

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WILLARD 2-VOLT STORAGE BATTERY
20 Ampere-Hours
Exact replacement for GE Model LB-530 portables—**brand new.**
Each **$1.95**
5" high, 3¾" wide, 3" deep.

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17 Amp. Hrs. Brand New **$17.95**

GOULD 6-VOLT STORAGE BATTERY
Navy Standard. Black Rubber Case. BRAND NEW. 15 Amp. Hour Rating **$6.95**

WILLARD MIDGET 6-V STORAGE BATTERY
3 amp. hour rating. Transparent plastic case. Brand new. 3¾"x 1½"x2½" high. Uses standard electrolyte. Each **$2.65**

7-PRONG 2-VOLT VIBRATOR for portable and farm sets. Replacement for GE-LB530 **$1.65**

1-QUART BOTTLE BATTERY ELECTROLYTE
Made by Willard, for above storage batteries. 1 qt. sufficient for 2 two-volt cells. Hermetically sealed. SPECIAL.
Per qt. bottle **$1.25**

BUBBLE SEXTANT, for Boat Owners'. Complete, sensational value. $12.95
EE8 ARMY FIELD PHONES, used, good cond. $12.95
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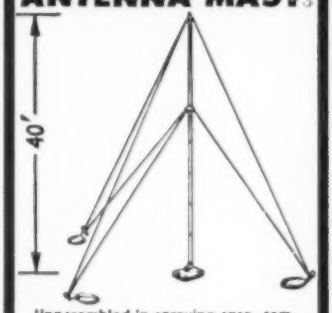

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- Axe M-1910—1
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- Strap—4
- Sledge Handle & Wedge—1
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$39.89
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Literature was bestowed on The Honorable Dr. Sergio Correa da Costa, Brazilian Consul. Dr. da Costa was honored "because of the contributions he has made in cementing the cordial relationship that exists between Brazil and the United States in his capacity as Brazilian Consul at Los Angeles, and in recognition of the brilliant diplomatic services rendered as former Secretary of the Brazilian Embassy in Buenos Aires and in Washington as member of the Brazilian delegation to the various Inter-American conferences, as acting delegate to the Governing Body of the Pan-American Union, to the Inter-American Economic and Social Council and to the Central Committee of UNRRA."

An honorary degree of Doctor of Science in Business Administration was conferred on Mr. Burton Browne of Chicago, Illinois. Mr. Browne received his award in recognition of "the valuable contributions he has made in the development of commercial motion pictures, in consideration of his outstanding research work in the field of industrial radio advertising, and for compiling and publishing an all-important book entitled, 'Best National Advertising of the Year.'"

Mr. Hilliard was the guest of honor at the banquet which followed the commencement ceremonies and was the principal speaker at this event. He presented to the graduates a story involving the history of Audio Engineering and the science of communications. He particularly directed the attention of the graduates to the fact that they, being the first Audio Engineers to have ever received degrees in Audio Engineering from a university, were about to embark on a career that offers to all of them a brilliant future, and that their future potentialities and achievements will be limited only by their sincerity of purpose, personal initiative, and determination to grow with a great and rapidly expanding industry.

It was Mr. Hillard's contention that the tremendous improvements and strides made in the radio, television, and motion picture industries within the past few years are indicative of the developments to come. He was of the opinion that the surface has hardly been scratched as far as engineering research and development is concerned, and contended that within the lifetime of those present, they will see marvelous improvements and developments that will be "sensational" when compared to the facilities which are being used today—facilities which considered standard and acceptable from an engineering point of view.

Dr. Benjamin M. Klekner, President of the University, paid warm tribute to his co-founder of the University, Dr. Howard M. Tremaine. Dr. Klekner reviewed the accomplishments of Dr. Tremaine, as well as the contributions he has made personally in the development of Audio Engineering facilities.

Dr. Tremaine informed the graduates that television is going to open

a new avenue of opportunity in the field of Audio Engineering, and that the need for audio engineers in the television industry is great. He also stated that if and when the Federal Communications Commission opens the ultra-high frequency channels to the video industry, literally thousands of television stations will be established throughout America and audio engineers will be needed to man the telecasts.

During the past six months the College of Audio Engineering of the University of Hollywood has mushroomed from a single building to an institution occupying five buildings. Their recording studios, audio frequency measurement laboratories, and film engineering laboratories are among the best equipped in the country. In the film engineering laboratory students are trained on *RCA* 35 mm. Standard Film Recorders, and the University boasts of the fact that it is an *RCA* Licensee. Because of this fact students are trained on the same equipment that is to be found only in the production and recording departments of the various motion picture studios.

Dr. Teffeau, Dean of the University, reported that the Board of Trustees of the University has leased four additional buildings which will be ready for occupancy September 1st, thereby enlarging the facilities for the College of Audio Engineering to nine buildings.

Other buildings which are being added to the University's facilities are designed to house one of the finest television production stages, and are to be occupied by the College of Television Technique of the University. In this proposed school students will be trained in the field of Television Engineering. The buildings are to be equipped with the latest television cameras, camera chains, booms, and consoles for mixing both video and audio.

Students Form Amateur Club

The Student Council of the University is very active and plays an important part in governing student activities. The student representatives are permitted to sit in on executive conferences with the officers and faculty of the University. Because the students are allowed to participate in the formulating of plans, practices, and procedures adopted by the University, a high degree of enthusiasm is generated. Recently, the Student Council of the University formed the University of Hollywood Amateur Radio Club, and the Federal Communications Commission granted them a license for the operation of a "ham" station. The call-letters assigned are W6IEK.

The Electronic Industry, which now includes many specialized fields, will be given even greater recognition now that Audio Engineering takes its place with Radio and Electrical Engineering as a recognized profession.

—30—

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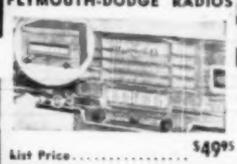

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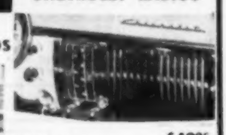

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PORTABLE TELEVISION 7" TUBE WITH BUILT-IN MAGNIFIER
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.5 mfd	400 VDC	.25	.20
1 mfd	500 VDC	.30	.25
2X.05 mfd	600 VDC	.25	.20
2X.1 mfd	600 VDC	.25	.20
.1 mfd	600 VDC	.30	.25
.5 mfd	600 VDC	.30	.25
1 mfd	600 VDC	.35	.30
BATHTUB			
40 mfd	25 VDC	$0.30	$0.25
4 mfd	50 VDC	.35	.30
50 mfd	50 VDC	.40	.35
4 mfd	100 VDC	.40	.35
2X.1 mfd	200 VDC	.15	.10
3X.1 mfd	400 VDC	.25	.20
2 mfd	400 VDC	.45	.40
.05 mfd	600 VDC	.20	.15
.25 mfd	600 VDC	.25	.20
.1 mfd	600 VDC	.25	.20
1 mfd	600 VDC	.35	.30
2 mfd	600 VDC	.45	.40
.05 mfd	1000 VDC	.50	.45
2X.1 mfd	1000 VDC	.55	.50
OIL-FILLED AND GE PYRANOL			
.5-.5 mfd	400 VDC	$0.35	$0.30
.1 mfd	500 VDC	.30	.25
1 mfd	500 VDC	.30	.25
1 mfd	600 VDC	.35	.30
2 mfd	600 VDC	.35	.30
4 mfd	600 VDC	.55	.50
5 mfd	600 VDC	.60	.55
8 mfd	600 VDC	1.00	.90
1-8 mfd	600 VDC	1.10	1.00
10 mfd	600 VDC	1.10	1.00
4 mfd	700 VDC	.65	.60
.5 mfd	1000 VDC	.45	.40
2 mfd	1000 VDC	.55	.50
.5 mfd	2000 VDC	1.10	.90
.25 mfd	3000 VDC	1.95	1.60
.5 mfd	3000 VDC	2.00	1.70
.1 mfd	7500 VDC	2.60	2.30
1 mfd	7500 VDC	5.25	4.45
.0008 mfd	15,000 VDC	6.95	6.50
.045 mfd	16,000 VDC	4.15	3.25
PAPER			
8-8 mfd	600 VDC Tobe Filtermite	$1.00	$0.90
3X8 mfd	600 VDC	1.45	1.25
8-8-4 mfd	650 VDC	1.45	1.25
160-160 mfd	150 VDC	1.25	1.00
ELECTROLYTICS			
2500 mfd	3 VDC	$0.15	$0.10
500 mfd	12 VDC	.50	.45
25 mfd	25 VDC	.20	.15
50 mfd	25 VDC	.25	.20
1000 mfd	25 VDC	.50	.45
150 mfd	50 VDC	.25	.20
2000 mfd	50 VDC	1.00	.90
500 mfd	200 VDC	1.00	.90

SPECIALS

80.86 KC Crystal with Holder	$1.50
CD-501A Cord Connects BC-654 Transceiver to GIV-45 Gen.	1.59
Balloon with Hydrogen Generator	2.50
Gibson Girl Box Kite 17"x17"x36"	2.25
50 Watt Tube Socket 872.211	.29
NE-2Neon Lamp	.05
Anti-Capacity Lever Switch 8 PDT	.80
33-440mmf Variable Condenser	.69
7-100 mmf Variable Condenser	.69
24-750 mmf Tapered Rotor Plates	.90
PL-150 Plug for BC-223 X Miter	.39
Battery Test Meter 0-10V, 0-35A	.85
Helipot 20,000 Ohms 5W 0.5% Linear, New, Ea.	4.50
10 for Ea.	4.00

CHECK THESE VALUES

Sound-on Film Hartron Recorder Reproducer #A-30 with crystal mike, headset, access.-inst. book. Plays back immediately. No processing of Film Required. Brand New	$170.00
BC-709 Interphone Amplifier Ideal for Aircraft Booster Telephone. New	$4.00
BC-312 Receiver, Used, Good Condition	$75.00
BC-224 Receiver, New, Less Mtg.	$100.00
BC-412 5" Radar Oscilloscope.	$49.95
BC-1072 Radar Transmitter.	$24.95

TUBES
PRICES SLASHED

2C34	$0.20	CEQ72	$1.20
2X2A	.50	CK-70	3.50
2X2/879	.35	CRP-72	1.20
3C24	.30	E-1148	.30
7C4/1203A	.30	HY-615	.25
10Y	.35	RKR-72	.55
15E	1.15	RK-73	.55
15R	.40	VT-127A	2.00
39/44	.25	VT-1	.40
45SPEC	.28	3BP1	2.25
HK-54	1.65	5CP1	1.95
713A	.65	5BP4	2.25
717A	.50	5FP7	1.00
801A	.25	1J6GT	.70
803	2.95	5T4	.85
804	6.50	6AC7	.75
826	.35	6C4	.25
864	.30	6H6	.45
808B	23.95	6K6GT	.40
872A	1.25	6K8	.75
1005	.20	6L6	1.00
1626	.25	6N7GT	.50
1629	.20	6SH7	.40
2051	.35	6SJ7	.55
7193	.20	6Y6GT	.65
8011	2.00	12SN7GT	.50
9002	.25	25L6GT	.50
9003	.35	25Z5	.40
9006	.20	33	.65
C3B	6.75		

TRANSFORMERS
PRIMARIES 115V 60CY

9V @ 750 MA 6.3V @ 3.9A. 5V @ 6 A. 2400 Test	$2.25
6.6V @ 0.6 A. 2000 V INS 2.60V @ 1.75 A. 2700 V INS	1.75
6.4V @ 10 A. 6.3 @ 0.6 A.	2.95
600-330V @ .08 ACT 5.0/2.5 @ 3 ACT	2.75
350-0-350 @ 120 MA. 5V @ 3 A. 6.3 V 4 ACT 6.3V	4.25

TIME DELAY SWITCHES

1 Minute 115 VAC 60 Cy Elec. In Waterproof Metal Case, New	$2.95
3 Micro Switches make contact at 40-41-42 Sec. Time Delay 110 VAC Motor. New	4.00
3 Micro Switches make contact at 2 minute time delay. 110 Vac Motor. New	4.00
Thermo Switch 50° to 300° F 115 Vac @ 6 A. 230 Vac @ 5A breaks contact with increase of temperature. New	.95
30-40 Second Mercury Time Delay Relay 110 Vac Adlake. New	4.95

ROUND PANEL METERS

0-5 RF Amps Westing	3½"	$4.50
0-300 MA DC Simpson	2¾"	3.75
0-300 MA DC Westing	2½"	3.75
5-0-5 MA DC Weston with 50 MA Shunt	3½"	4.25
0-8 Amps DC McClin	2¾"	1.95
0-50 Amps DC Weston	3½"	4.75
0-100 Amps DC Hoyt	3"	3.00
0-3 Volts DC Sun	2½"	1.95
0-15 Volts AC GE	3½"	4.95
0-2500 Volts DC Simpson with Multiplier	3½"	4.95
0-5 KV DC 0-10 MA DC	3½"	5.50
0-150 Volts DC Hoyt	3½"	3.50
10-0-6 DB Weston	2½"	4.50

PORTABLE METERS

0-10 Amps DC Weston	489	7.50
0-3-6-30 Volts DC Weston	280	17.50
0-100 Amp DC Weston with 100 Amp Shunt	269	19.95
0-25 Amps AC Weston	433	22.50
0-1.5-6 Volts AC Output Meter Weston	571	10.95

POWER EQUIPMENT

Voltage Regulator Raytheon 95/130 V 60 Cy 1.25 Amp Output 115V 60 Watt, New	$9.50
Inverter PE-151 Input 12VDC Output 110 VAC 150 W 60 Cy. New	10.95
Vibrapack VPQ 309 12 VDC Output 250V @ 70 MA Synchronous Mallory. New.	3.45
ATR Inverter and Regulator 12 VDC to 110 VAC 50/60 Cy 100 Watt Model 8RB. New	16.50
Vibrator ATR 2410 24 VDC Output 110V 100 W. New	2.95

LINEAR POTENTIOMETERS WW

Ohms	Watts	Mfg'r	Each	Ten
20	25	OHMITE	$ .45	$ .40
25	25	DEJUR	.45	.40
50	25	DEJUR	.50	.45
100	25	IRC	.50	.45
200	25	DEJUR	.55	.45
500	25	DEJUR	.55	.50
1000	25	DEJUR	.55	.45
3000	25	DEJUR	.65	.55
5000	25	DEJUR	.65	.60
15,000	25	DEJUR	.70	.65
20,000	25	DEJUR	.85	.70
6	50	DEJUR	1.00	.90
150/W SWITCH	50		1.25	1.00
200/W SWITCH	50	IRC	1.25	1.00
600	50	OHMITE	1.10	.95
10,000	50	DEJUR	1.50	1.25
15	60	IRC	1.50	1.25
750	150	OHMITE	2.45	2.10

SPECIAL VALUES

De-ion Line Starter DPST 115V 60 CY 15A 1HP Rating Westinghouse. New	$3.25
Genuine Upright Desk Telephone and Ringing Box. New	3.25
1 Micro Second Delay Line 15 KVA 400 Cy 50 Ohm. New	4.95
T-17 Microphone. New	1.65
HS-33 Headsets. New	2.45
T-30 Throat Mike. New	.49

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19" TV CHASSIS

4 I.F. STAGES!

$129.50* 19" less CR tube $179.50* 19" with CR tube

$124.95* 16-inch CHASSIS AS PICTURED LESS CR TUBE

WITH TUBE $154.95*

CLEAR, FAULTLESS RECEPTION IN OTHERWISE IMPOSSIBLE LOCATIONS!

- No external makeshift! Weak-signal reception is engineered into the design in two exclusive extras: Four - stage wide - band high - gain I.F. amplifier for super-sensitivity with true 4 MC band width for picture clarity, plus Low-signal current regulation in exclusive electronic Automatic Focus circuit. Result: The best fringe area design! Picture and sound exactly as televised — no distortion whatsoever.
- Limiter control provided for "primary service areas." Perfect reception in close-in areas also!
- Vertical and Horizontal Hold Controls on front panel eliminate rear, panel adjustments when line voltage changes and when tubes age.
- Full twenty tube chassis, including many dual purpose tubes, and two crystal diodes.
- Standard turret-type tuner for highest gain and noise rejection.

GREATEST TV BARGAINS EVER!

- Complete twelve-channel coverage.
- RCA-licensed fully Automatic Gain Control keeps both picture and sound at the same level from one station to another.
- Phonograph switch and phonograph input. Beautiful sound reproduction for any make record player.
- Complete service manual and schematics furnished with all sets.
- Famous Sheldon "soft-light" CR tube for easy vision viewing. Better than filters!
- 12-inch high quality heavy-duty P.M. speaker, knobs, and mounting hardware included in all prices shown for 16" and 19".

GET THE BEST ENGINEERING AT THE LOWEST PRICES!

- 16-inch console, in beautiful hand-rubbed hardwood cabinet (as pictured, Mahogany) $199.50*
- 19-inch console, in beautiful hand-rubbed hardwood cabinet (Mahogany) $229.50*

*Add $1.28 excise tax to all prices shown. Blonde cabinets available at $5.00 additional. California buyers for use, add sales tax. Out of town buyers add $4.00 packing charges.

"FAMILY-SIZE" TABLE MODEL
Electrically identical to chassis above —including 4 stages of I.F., phono attachments, etc. Beautiful, extremely durable mahogany grain-finish on unbreakable tempered Masonite, appearance like hand-rubbed Philippine Mahogany! Famous Sheldon 12½-inch black tube. 4"x6" hi-fidelity speaker. Astounding low price of only $149.50*

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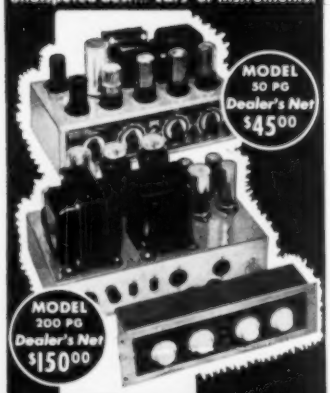

Exclusive feedback circuits. Model 200PG offers frequency response of ±0.1 DB, 10 to 50,000 CPS. Distortion at 20 watts is 0.2% — no phase shift or transient oscillations of any kind. Write today for free technical bulletin.

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No. AT103 for Oval Jumbo Twin Lead
No. AT103 Also for Tubular Twin Lead
BOTH Models Conform With Fire Underwriters and National Electrical Code Requirements for OUTDOOR installations.

$2.25 EACH

SIMPLE TO INSTALL — For maximum efficiency arrester should be mounted outside window nearest to TV receiver, with ground wire attached to nearest grounded point. No stripping, cutting or spreading of wires necessary. Supplied complete with 4-ft. length of Ductile Aluminum Ground Wire for Wall Mounting, and Strap for Mast or Grounded Pipe installation.

JFD MANUFACTURING CO., Inc.
6127 18th Avenue, Brooklyn 4, N. Y.
First in Television Antennas & Accessories

Oscilloscope

(*Continued from page* 33)

checking in transmitters. For this application, two r.f. pickup loops will be required. Connect one loop to terminals *C* and *D* and couple it to the crystal oscillator tank. Connect the other loop to terminals *A* and *B* and couple it to the tank of the multiplier stage under check. Fig. 3 shows the patterns

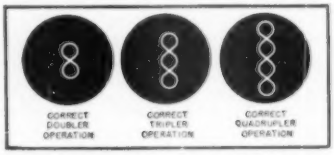


Fig. 3. Trapezoidal patterns used in checking harmonic operation of transmitters.

obtained for correct doubler, tripler, and quadrupler operation. No sync circuit is needed—the pattern remains perfectly stationary on the screen, since in the case of frequency drift each stage drifts by the same percentage and in the same direction. This method of checking harmonic operation often is more reliable than use of a wavemeter or similar device. —30—

FCC EXAMS

AT a session of the Federal Communications Commission held at its offices in Washington, D.C. on May 12th, the Commission took under consideration the necessity for amending the Appendix to Part 12 of the Rules and Regulations to reflect certain changes in its list of points at which examinations for radio operator licenses may be taken.

It was ordered that effective June 3rd, the Appendix to Part 12 of the Commission's Rules and Regulations be amended as follows:

Examination Points: (a) Delete Cleveland, Ohio, from and add Mobile, Ala. to the list of points at which examinations are given by appointment. (b) Delete the list of points at which examinations are given quarterly, semi-annually, and annually, and substitute the following list.

Quarterly Points: Birmingham, Ala.; Little Rock, Ark.; Phoenix, Ariz.; Fresno, Calif.; Ft. Wayne and Indianapolis, Indiana; Davenport and Des Moines, Ia.; Grand Rapids, Mich.; Jackson, Miss.; St. Louis, Mo.; Omaha, Neb.; Schenectady and Syracuse, N. Y.; Winston Salem, N. C.; Cincinnati, Cleveland, and Columbus, Ohio; Oklahoma City and Tulsa, Okla.; Pittsburgh and Williamsport, Pa.; Sioux Falls, S. D.; Knoxville, Memphis, and Nashville, Tenn.; Corpus Christi and San Antonio, Tex.; Salt Lake City, Utah; Charleston, W. Va.; and Milwaukee, Wis.

Semi-annual Points: Tucson, Ariz.; Bakersfield, Cal.; Hartford, Conn.; Jacksonville, and Tallahassee, Fla.; Boise, Idaho; Wichita, Kan.; Louisville, Ky.; Bangor and Portland, Maine; Marquette, Mich.; Butte, Mont.; Manchester, N. H.; Albuquerque, N. Mex.; Wilmington, N. C.; Jamestown, N. D.; Hilo, Lihue, and Wailuku, Territory of Hawaii; Amarillo and El Paso, Tex.; Roanoke, Va.; and Spokane, Wash. —30—

NEW TV PRODUCTS on the Market

FRINGE AREA ANTENNA

Trio Manufacturing Company of Griggsville, Illinois, has developed a new television antenna designed especially for fringe area applications.

The new "Controlled Pattern" antenna system provides high gain in the forward direction and overcomes co-channel interference. A high voltage from two double dipole Yagis is phased by the use of the new tunable "Phasitron" to provide addition of voltages from the desired direction and cancellation of undesired voltages. The unit uses two 300-ohm feed lines of random length, two double-folded Yagis for exact impedance matching. Separate antenna systems are available for each of 12 channels, though considerable gain is achieved on adjacent channels.

HIGH-GAIN ANTENNA

Technical Appliance Corporation of Sherburne, New York has developed and is marketing a new all-channel, high-gain antenna designed to emphasize reception on Channels 11, 12, and 13.

The new *Taco* "Tri-X" is being offered for use in areas where the Lazy-X does not provide sufficient gain for the upper end of the high band. The forward angle of the antenna elements has been increased and a third antenna element added in between other antenna elements to provide the conical effect necessary for this type of antenna.

Special noise-snubbers eliminate the wind-whistle effect and a new apex design has been used to overcome the inherent weak point of X-type antennas.

The company's "Jiffy-Rig" type of construction, used in the antenna, assures quick, easy, and permanent assembly of the array.

For full details and prices on this new antenna array, write direct to the company at the Sherburne address.

SWEEP GENERATOR

A new television-FM sweep generator and marker which is combined in a single instrument is currently being offered by *Radio City Products Co.* of 152 West 25th Street, New York 1, New York as the TV-80.

The sweep generator uses an electromagnet type of sweep and two oscillator circuits. The design incorporates an internal blanking circuit that permits the retrace to be blanked out independently regardless of the type of oscilloscope used.

The unit has a range of from 5 to 240 mc., continuously variable. The sweep width is variable from 400 kc. to 10 mc. The marker range is from 17 to 48 mc. The instrument is housed in a steel cabinet finished in grey and white and measures 15 x 9 x 7 inches. It weighs 14 pounds and operates on 105-125 volt a.c. power

VIDEOTRON TUBE

National Union Radio Corporation of Orange, New Jersey has recently added two new 16" and 14" rectangular units to its line of cathode-ray tubes.

The *N.U.* 16KP4 is a 65 degree direct view tube which provides a 10⅛" x 13½" rectangular picture having the standard 3 x 4 aspect ratio. It features a face plate having an integral neutral gray filter which increases the contrast ratio when viewing under ambient light conditions. The tube utilizes the new tilted beam type gun to obtain improved picture detail. It requires only a single field ion trap. The 16KP4 is identical to the *N.U.* 16TP4 except for an increase in neck length to 7½" which permits adaptability to a greater range of focus coil and deflection yoke designs.

The *N.U.* 14CP4 provides an 8⅝" x 11½" rectangular picture but in other respects is similar to the 16KP4.

ROOF MOUNT

Joseph R. Steele Mfg. Co. of P.O. Box 854, New Haven, Conn. is in production on a new, universal roofmount which has been designated the "OMA."

The new unit fits any sized mast from ¾" to 1¾", and can be installed on any type of roof. The unit is constructed of heavy gauge steel and is plated with a heavy zinc plating.

ELECTRICAL TAPE

Minnesota Mining and Manufacturing Co.'s "Scotch" brand No. 33 electrical tape is applicable to many television installation and maintenance operations, according to the new pocket-sized folder just released.

The tape which has 7000 volts dielectric strength, 7 mil thickness and unusual resistance to sunlight, aging, water, salt water, acids and alkalies is especially recommended for such TV applications as wrapping the antenna leads to keep moisture out and prevent snow on the picture tube, wrapping of a high voltage harness to prevent shorting, and taping the eye for a television lead.

The folder and tape samples are available from the company at 900 Fauquier Street, St. Paul 6, Minn.

TV BOOSTER

Peak tuning and close impedance match on any channel, accomplished from the cabinet exterior, is the unusual feature of the new television preamplifier SP5 recently developed by *Radio Merchandise Sales Co., Inc.* of 1165 Southern Blvd., New York 59, New York.

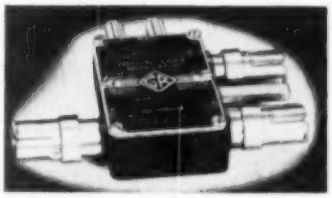
The new booster which is housed in a mahogany finished metal cabinet, provides wide bandwidth, good signal-to-noise ratio and low insertion loss. Tuning is accomplished by a single gear-driven knob.

Full details are available from the company on request.

DIODE MODULATOR

Designed for laboratory use, TV receiver production testing, and television service work, the new Type 1000-P6 crystal diode modulator has been announced by *General Radio Company* of 275 Massachusetts Avenue, Cambridge 39, Massachusetts.

The new unit converts an oscillator, standard signal generator, or other r.f. source into a test signal generator for television receiver testing. It modulates the oscillator signal after attenuation so that reaction on the oscillator frequency is negligible. Thus it produces an amplitude modulated signal with no significant incidental FM.



The range of modulating frequencies is 0 to 5 mc. and the carrier frequency range is 20 to 1000 mc., covering the proposed new u.h.f. television bands as well as the currently used frequencies.

For receiver testing, a video signal can be conveniently derived from a TV receiver tuned to a local channel. With this video signal applied to the

MOSLEY FLUSH SOCKETS

F-1

F-11

MOSLEY FLUSH SOCKETS install as neatly as any electrical outlet with standard metal outlet boxes and wall receptacle plates. They conceal antenna lead-ins and rotator cables within wall.

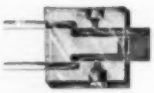
CAT. F-1. A single two wire outlet.
CAT. F-11. Two single two wire outlets for two antenna lead-ins.
CAT. F-14. One single two wire and one single four wire outlets for antenna and rotator.
CAT. F-15. One single two wire and one single five wire for antenna and rotator.

F-14

F-15

MOSLEY PLUGS

Fits Mosley Flush Sockets



300-P

CAT. 300-P, For 300 ohm transmission line.

CAT. 300-1P, For shielded cable such as Anaconda ATV-225 and Federal K-111.

CAT. 301-2P and 301-5P, Four and five pin plugs for four and five wire antenna rotator and control systems.

300-1P

301-2P

301-5P

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WIRE RECORD-PLAYBACK HEAD, most popular, 2 pin, triple coil (incl. eraser). Special $6.95
SHIELDED SOCKET for wire head ... 35
WIRE SPOOL HUB for standard spools ... 39
WIRE TAKE-UP TURNTABLE, plastic ... 2.75
ALNICO ERASE MAGNET for wire or tape ... 39
RM-4 RECORDING MOTOR (G.E.), hvy. duty, 115V, AC, 3/4g, 2 3/4" x 2 3/4" x 3 1/2", incl. plate & drive wheel ... 4.98
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TV SAFETY GLASS, shatterproof, 10¼"x10¼" ... 98
10" TV FRAME, gold & plastic ... 50
120" WHIP ANTENNA, 3 screw sects. & spring base ... 1.98
JK-24 PHONE JACK, 3 way ... 19c ... 6 1.00
DPDT ANTI-CAPACITY SWITCH ... 39c ... 3 1.00
RADIO HARDWARE TREASURE, FULL POUND CAN of Nuts, Screws, Washers, Lugs, etc. ... .69
HEARING AID AMPLIFIER, 2 tube ... MAKE REAL VEST POCKET RADIO adding simple inner COMPLETE WITH SCHEMATIC FOR 2 OR 3 TUBE SET ... 2.49
HEARING AID TUBES for amplifier. Set of 2 ... 2.49
21/2" SQ. PANEL METERS, 0-50 DC or 0-10 Amps DC, with shunt ... 98
50W-25 OHM adj. resistor ... 29c ... 4 1.00
TU-17A TUNING UNIT (RC-223) ... 2.49
AUTO NOISE SUPPRESSORS (universal ... 4 ... 25
RG-13 U CO-AX, 20 ft. lots, & joints ... 98
W-110 FIELD WIRE, only 1500-2000 ft. only ... 12c ft.
1" WESTON METER FRAME & GLASS (r.p.m.) ... 69
2" ROUND METER CASE & GLASS, 1" deep ... 39
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modulator, and an oscillator tuned to the desired carrier, a TV picture can be placed on any desired channel merely by tuning the carrier oscillator.

The modulator is small, compact, and equipped with Type 874 coaxial connectors for r.f. input, output, and for modulation input. Adaptors are available for connection to other types of terminals. Impedance is 50 ohms for r.f. circuits, and coaxial 50 ohm attenuators and other accessories are available.

DU MONT COLOR TUBE

The *Allen B. Du Mont Laboratories, Inc.* of Passaic, New Jersey has announced that the U.S. Patent Office has granted Patent No. 2,508,267 covering a three-color direct-view television tube.

The tube was invented by Henry Kasperowicz of the company's laboratories and the patent was applied for October 26, 1945. In its construction, the new tube is similar in most ways to the familiar black-and-white picture tube except for a new form of fluorescent screen. The new color tube has a fluorescent screen composed of tiny fluorescent dots which give forth red, blue, and green colors respectively when struck by the electron beam. The tiny dots are arranged so that each dot of one color is adjacent to adjoining dots of another color.

The new color television tube can be used in any one of the three color systems now under consideration by the FCC, namely the field sequential, dot sequential, or line sequential.

TV SCOPE

A new high-gain, wide-band cathode-ray oscilloscope designed particularly for television circuit, laboratory, and industrial applications has been announced by the Radio Tube Division of *Sylvania Electric Products Inc.* of 1740 Broadway, New York 19, New York.

The new type 400 oscilloscope, which comes equipped with a 7-inch 7JP1 green screen cathode-ray tube, provides a vertical sensitivity of 10 milli-

volts per inch and a vertical response which is useful up to 4 mc.

Other features include a four-position, frequency-compensated attenuator for uniform frequency response at any gain setting; vernier gain control; low internal hum level; internal 60 cycle sine wave sweep which eliminates one set of leads during TV align-

ment operations; wide-range phasing control; internal hard tube sweep circuit; control for synchronizing to either positive or negative signal; good vertical bounce and return characteristics; and rapid return trace.

"TELE-TURNER"

The *Joseph Shaw Company* of 6225 Benore Road, Toledo 12, Ohio is currently marketing a new, mechanically-operated, non-electric antenna rotator which sells in the moderate price class.

Known as the "Tele-Turner," the new unit is easily installed and operated. It comes complete with directional indicator, inside manual control,

and all necessary hardware. The rotator is ball-bearing equipped and locks the antenna into position easily and positively.

A data sheet covering the "Tele-Turner" is available on request.

24-INCH TUBE

General Electric Company of Syracuse, New York is currently setting up production lines to manufacture a new 24-inch direct-view picture tube slated for appearance this fall.

In addition to its large size, the tube features a dark face plate which improves contrast and detail and an aluminum backed fluorescent screen which increases the picture brightness and permits operation at lower voltages.

LOW-LOSS LEAD-IN

An ultra low-loss transmission line of open wire construction for TV receiver antenna lead-in and amateur-commercial transmitting and receiving applications, has been announced by the *Gonset Company* of Burbank, California.

Known as the *Gonset* Line, it will replace ribbon type molded lead-in to advantage particularly in fringe areas, or wherever else weak signals are encountered.

Using polystyrene spacers to minimize dielectric losses, and one inch spacing to minimize line pick-up and radiation losses, the new line exhibits only .5 db. loss per 100 feet at 200 mc. and the losses do not increase appreciably under unfavorable weather conditions or with aging.

Accessory items include standoff insulators and a broadband linear trans-

¾ RPM ANTENNA ROTATOR MOTOR
High torque, reversible motor—operates directly from 110 Volt 60 cycle by use of condenser. Light weight, quiet running, rugged built, positive stop, easily mounted. Normally operates from 110 Volt 400 cycle. Complete—with instructions. NEW **$4.95**

10 MFD 400 Volt Cond., **$1.00**, SPST Momentary Switch, **35c**, DPDT Momentary Switch, **75c**, Resistor, 100 ohm 25 Watt, **50c**, 4 Wire Cable, **5c** per ft. COMPLETE KIT OF PARTS—Motor, Cond., SPST Switch, and Resistor **$8.95**

TRANSMITTERS and RECEIVERS:

	USED:	NEW:
BC-357 Marker Beacon Rec.	$2.95	
BC-347 Amplifier, 4 tubes	1.00	
BC-347C Amplifier, with Tubes		$2.95
BC-1206 Receiver, 200-400 KC	$4.95	6.95
BC-458 Trans. 5.3 to 7 MC	5.95	8.95
T-20-ARC-5 Trans. 4 to 5.3 MC		8.95
BC-454 Receiver, 3 to 6 MC		6.95
BC-453 Receiver, 190—550 KC	$11.95	

METERS:
0-150 Volt AC 2" Round $3.95
0-150 Volt 400 Cycle 2½" Round 2.95
0-5 Amp. AC 2" Rd. 0-100 A. Scale 3.95
0-5 Amp. AC 2" Rd. 0-75 A. Scale 3.95
0-5 Milliamp AC 2½" Square 2.95
0-500 Microamp 2½ Rd. w/0-15 & 0-600 DC Volt Scale 3.95

GEARED MOTOR

Ideal reversible motor for rotating antennas, displays, etc. Weight: 4 lbs. Overall size: 7" long, less shaft. Gear Box size: 3¾" x 3¾". Motor size: 4" x 2½". Shaft size: ⅜" x 1⅜" threaded. Operates from 24 volt DC, 2.9 A., 9 RPM or 26 volt AC at 75 lbs. per inch torque. Price **$5.95**
TRANSFORMER—110 Volt 60 cycle primary, secondary 26 Volt AC, 2.5 A. Price: **$2.95**. RHEOSTAT to control speed 50 ohm, 50 Watt, **97c**

DYNAMOTORS:

INPUT:	OUTPUT:	STOCK NO.	PRICE
9 V. DC	450 V., 60 MA.	DM-0450	
or 6 V. DC	275 V., 50 MA.	w. Blower	$3.95
12 or 24 V. DC	440 V. 200 MA. & 220 V. 100 MA.	D-104	9.95
12 V. DC	600 V. 500 MA.	RD-86	7.95

PERMANENT MAGNET FIELD DYNAMOTORS:

12 or 24 V. DC	275 V. 110 MA.	USA/0516	$3.95
12 or 24 V. DC or 6 V. DC	500 V. 50 MA. 240 V. 50 MA.	USA/0515	2.95

PM FIELD DYNAMOTOR POWER SUPPLY—Completely filtered. Has two PM Dynamotors as listed directly above **$5.00**
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20 Watt Transmitter with crystal or MO control on four pre-selected channels, 2000 to 5250 KC., by use of three plug-in coils. Five Tubes: two 801 & three 46. With TU-17 Tuning Unit 2000 to 3000 KC. and Cable, less mte. BC-223 NEW: **$24.95**
OPERATING MANUAL for BC-223 ..... **$2.00**
SPARE TUBE KIT for BC-223—Contains 5 spare tubes in metal box. Price **$4.95**
TUNING UNITS: TU-17—2 to 3 MC.; TU-18—3 to 4.5 MC.; TU-25—4.5 to 5.2 MC.
NEW: **$3.50** Ea. USED: **$2.50** Ea.
PE-125 VIBRATOR POWER SUPPLY for BC-223 Transmitter. 12/24 Volt input; output 500 Volt 150 MA. Price ..... NEW **$9.95**
MOUNTING for PE-125 ..... **1.50**
SPARE VIBRATOR & TUBE KIT. For PE-125—Contains 2 spare tubes, 2 spare vibrators and fuses in metal box. Price **$4.95**
CABLE only—Transmitter to Power Supply **1.75**

GN-45 HAND GENERATOR
Complete with Leg and Seat Assembly, and cranks! Generator supplies 6 Volts 3 amps. and 500 Volts 140 MA. at 60 RPM. Used with SCR-284. NEW: **$9.95**
CD 501 Cord used from GN-45 or PE-103 to BC-654. Price **$2.00**

BLOWERS:

110 VOLT 60 CYCLE (Pictured). 6" intake, 2" outlet. Approx. 100 Cu. Ft. Dis. Motor size: 7"x9". 1550 RPM. Quiet running. Prices: NEW: **$7.95**—Motor only **$3.95**
24 VOLT DC or 36 VOLT AC—6" intake, 2" outlet. Approx. 200 Cu. Ft. Dis. Also has adapter for Dual outlet. Unused. Price **$5.95**

MARK II TRANSMITTER & RECEIVER
Ideal for mobile or stationary use. 15 Tube Set transmits and receives 2 to 8 MC. Phone, CW and MCW 25 Watt Master Oscillator Control. Transmits and receives 240 MC. Phone. Also an intercommunicating set. Comes complete with 15 Tubes, Headset, Micro., Antennas, Control Box, 12/24 Volt Power Supply, and instructions—ready to operate. Set size: 27"x19"x13½". Price: NEW **$59.50**, USED (TESTED): **$39.50**
Available—All Parts and Accessories for Mark II Sets!

NEW TRANSFORMERS And CHOKES
ALL FOLLOWING TRANSFORMERS—CASED 115 V.A.C. 60 CYCLE INPUT:
OUTPUT: 750-0-750 V.A.C. (600 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amp. and 5.0 V.A.C. winding at 4 amps. NH-108 ..... **$8.75**
OUTPUT: 600-0-600 V.A.C. at 250 MA. 12 V.A.C. at 3 amps.; 12 V.A.C. at 3 amps and 5 V.A.C. at 3 amps. Designed for Army surplus transmitters. NH-108 ..... **$7.75**
OUTPUT: 250-0-250 V.A.C. at 60 MA. 24 V.A.C. at 4 amps.; 6.3 V.A.C. at 6 amps. Designed for Army Surplus Receivers. NH-109 ..... **$3.50**
TRANSFORMERS—110 V. 60 CYCLE PRIMARIES:

SEC.:		SEC.:	
12 V. 1 amp.	$1.50	24 V. 2 amps.	$2.25
24 V. 1 amp.	1.95	24 V. .5 amp.	1.50
36 V. 2.5 amps.	2.95	24 V. 4½ amps.	3.95
Sec. 14-14 or 28 V. 7½ or 15 amps.			4.95

CHOKES—CASED:
NH-115—8 Henries at 500 MA. filter choke, 5,000 volt insulation **$10.95**
NH-116—5.24 Henry 500 MA. swinging choke, 5,000 volt insulation **$10.95**
NH-121—12 Henries at 250 MA. filter choke, 1,500 volt insulation **$4.95**
NH-112—4-12 Henries 81 ohm. Gov't conservative test voltage 2500 V. 300 MA. **$4.95**

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MAST BASES—INSULATED:

MP-132—(Illustrated). 1" heavy coil spring. 2" insulator. Overall length 19½". Weight 2¼ lbs. Price **$3.95**
MP-22—Spring action direction of bracket. 4 7/8" mounting. Price **$2.95**
MAST SECTIONS FOR ABOVE BASES:
Tubular steel, copper coated, painted, 3 foot sections, screw-in type. MS-51 can be used to make any length, with MS-52-51-50-49 for taper.
Price—any section ..... Ea. **50c**
MS-54 or 55. Larger sections than MS-53 ..... Ea. **75c**
BAG BG-56 for carrying 5 Mast Sections **50c**

BC-645-A TRANSCEIVER
110 VOLT TRANSFORMER AND CHOKE
15 Tube Transceiver, Ideal for conversion to 460 MC. Citizens Band. Frequency coverage 435 to 500 MC. With conversion instructions.
Price: New and Boxed BC-645-A **$14.95**
SET of Plugs & Antennas f. BC-645-A **$9.95**
TRANSFORMER for BC-645-A—110 Volt 60 cycle input; output 400 Volt 150 MA. after filter, 12, 9, and 5 V. AC. 4 amps and 5 V. 3 amps. No. NH-645 ..... **$6.95**
CHOKE—15 Hy. 150 MA. Order No. NH-646 ..... **2.95**
PE-101 DYNAMOTOR—12/26 V. input **2.95**

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5 Gang with vernier tuning, 25 MMFD to 450 MMFD each section. Size: 7⅛"x3⅛"x3⅛". Price **$2.95**
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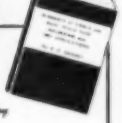

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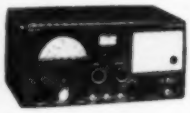

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RG 10/U	52	125.00	RG 41/U	67.5	575.00
RG 11/U	75	100.00	RG 54/U	58	65.00
RG 12/U	75	190.00	RG 54/AU	58	75.00
RG 13/U	74	125.00	RG 55/AU	53.5	60.00
RG 18/U	52	450.00	RG 57/U	95	100.00
RG 19/U	52	350.00	RG 58/U	53.5	50.00
RG 20/U	52	450.00	RG 59/U	73	40.00
RG 22/U	95	110.00	RG 62/U	93	50.00
RG 24/U	125	240.00	RG 74/U	52	250.00
RG 25/U	48	575.00	RG 77/U	48	100.00

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SS-1AF	$ .15	SS-16S	$ .15	UG 25/U	$ .60
SS-1F	1.12	SS-22AP	1.10	UG 27/U	.68
SS-1H	.10	SS-22R	.48	UG 59/U	.60
SS-1J	.80	SS-22SP	.60	UG 61/U	.60
SS-1R	.28	UG 13/U	.60	UG 85/U	.62
SS-1SP	.28	UG 21/U	.67	UG 87/U	.68
SS-1SPN	.28	UG 22/U	.60	UG 167/U	2.00
SS-1T	1.12	UG 24/U	.60	UG 281/U	.60

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former for matching the line to 300 ohms for television applications. The line is available in continuous lengths up to 500 feet.

ALL-BAND ANTENNA

JFD Manufacturing Co., Inc. of 6101 Sixteenth Ave., Brooklyn 4, N. Y., is now in production on a new "Vee-Beam" all-band television antenna which has been specially engineered to deliver the highest gain and sharpest directivity possible with a minimum of noise and interference.

Employing the "end fire" principle, the new antenna delivers high gain and directivity on the upper band. In addition, the new array provides gains up to 10 db., a single-stack gain of 7 db. on uppper channels with 11 db. for double stacks. The unit is designed to match 300 ohm sets.

Complete information and literature on the new array is available on request.

RAYTHEON COMBINATION

The *Belmont Radio Corp.* Division of *Raytheon Manufacturing Co.*, 150 E. 50 Street, New York 22, has recently added "The Devonshire" to its line of "Silver Anniversary" model television receivers.

This Model RC-1405 combination unit features a 16" glareless picture

tube, an AM-FM radio, and three-speed phonograph which plays all size records. The new set also has the "Ray-Dial" tuner, Synchromatic Stabilizer, a pre-fixed focus, and a built-in "Ray-Tenna" aerial.

The set is housed in a hand-rubbed mahogany veneer cabinet of authentic period design. Provision is made in the cabinet for record storage. The radio and phonograph will play with the full-length doors either open or closed.

FARADAY SHIELD

In order to reduce TVI caused by capacitively coupled harmonic radiation, the *E. F. Johnson Company* of Waseca, Minnesota, has introduced a new Faraday Shield which has been designed to be attached directly to the link.

With this new unit there is no limitation in the use of shields with any standard *Johnson* plug-in link from 2 turns to 10 or 12 turns. Construction of the shield includes a screen of con-

ductors plated on low-loss polystyrene sheets. The pattern of conductors is such that the shields may be trimmed slightly for adaptation to other makes of links.

With a hood over the link terminals and copper braid covering the link leads, shielding is complete. Screens are grounded to the hood by means of a contact on the link. It is not necessary to disconnect the ground lead to change plug-in links.

Four models of the Faraday Shield are available; for 150/500 watt swinging links, 1000 watt swinging links, in complete assemblies and the same values, shield only.

A complete data sheet on the new shield is available on request.

VIDEO COMBINATION

Admiral Corporation of 3800 W. Cortland Street, Chicago 47, Illinois, has announced the availability of a new TV and radio-phonograph unit which features a 16" rectangular tube.

The new set is available in two versions, the 36 R 45 and the 36 R 46, in

walnut and mahogany cabinets which are classic modern adaptations of 18th century furniture design. The cabinets allow for roomy record storage and are equipped with doors so that all of the electronic equipment is concealed when the instrument is not in use.

"MICROSTICK"

An ingenious television "ruler" which can actually measure the millionths of a second it takes for a television signal to travel across the face of a picture tube has been devised by the Tube Department of *Radio Corporation of America* as an aid to service technicians in television picture analysis.

The "Microstick" is a transparent plastic ruler which in use is held flat against the safety glass of a television receiver to check a number of factors important to reception. The ruler is scaled for use with all picture tube sizes.

The unit may be used to measure the bandwidth of a television receiver, calibrate vertical wedges in test patterns, determine the beat frequency of interference, and measure the air path distance of ghosts and other reflected signals. In addition, the ruler is useful for determining the frequency of ringing in video circuits and for measuring

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1A3	.49
1A4P	.39
1A5GT	.49
1A6	.39
1A7GT	.69
1B3/8016	.59
1B4	.49
1B5/25S	.49
1C5GT	.59
1C6	.39
1C7G	.49
1D5GP	.49
1D7G	.49
1D8	.69
1F4	.39
1F5G	.49
1G4GT	.69
1G6G	.59
1H4G	.69
1H5GT	.59
1J6G	.49
1L4	.49
1N5GT	.59
1P5GT	.49
1Q5GT	.69
1R5	.49
1S4	.89
1S5	.39
1T4	.39
1T5GT	.69
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1X2	.79
2A3	.99
2A4	1.29
2A5	.69
2A6	.49
2A7	.49
2B7	.69
2E22	.49
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2X2A	.89
2X2/879	.59
3A4	.39
3A5	.69
3B7/1291	.39
3D6/1299	.39
3Q4	.49
3Q5GT	.79
3S4	.49
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5X4G	.59
5Y3GT	.39
5Y4G	.49
5Z3	.69
5Z4	.59
6AB4	.49
6AB5/6N5	.89
6AC5GT	.59
6AC7M	.89
6AG5	.39
6AG7	1.29
6AH6	.59
6AJ5	.99
6AK5	.79
6AK6	.69
6AL5	.49
6AN5	.99
6AQ5	.39
6AQ6	.49
6AR5	.49
6AS5	.59
6AT6	.39
6AU6	.39
6AV6	.49
6A3	.99
6A6	.99
6A7	.69
6A8GT	.69

Type	Your Net Cost Each
6B4G	1.19
6B5	.99
6B6G	.69
6B7	.99
6B8G	.49
6BA6	.39
6BA7	.49
6BC5	.59
6BE6	.39
6BF6	.49
6BH6	.39
6BG6G	.99
6BJ6	.49
6BQ6GT	.69
6C4	.39
6C5GT	.39
6C6	.49
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6J7GT	.49
6J8G	.99
6K5GT	.49
6K6GT	.39
6K7GT	.49
6K8GT	.79
6L5G	.49
6L6G	.89
6L6GA	.89
6L6M	1.19
6L7G	.49

Type	Your Net Cost Each
6N7GT	.89
6N7M	.89
6P5GT	.49
6Q7GT	.59
6R7G	.49
6R7GT	.49
6S7G	.49
6S8GT	.49
6SA7GT	.39
6SC7M	.69
6SD7GT	.39
6SF5GT	.49
6SF7M	.69
6SG7M	.69
6SH7GT	.39
6SJ7GT	.49
6SK7GT	.39
6SL7GT	.49
6SN7GT	.49
6SQ7GT	.39
6SR7M	.49
6SS7GT	.49
6SS7M	.69
6T7G	.49
6T8	.69
6SU7GT	.49
6U5/6G5	.79
6U7G	.39
6V6GT	.39
6W4GT	.39
6X4	.39
6X5GT	.39
6Y6G	.69
6Z7	.49
6ZY5	.49
10Y	.49
12A6	.39
12A7	.59
12A8GT	.39
12AH7	.59
12AT6	.39
12AT7	.49
12AU6	.39
12AU7	.49
12AX7	.49
12BA6	.39
12BA7	.49
12BD6	.49
12BE6	.39
12BF6	.39
12C8	.89
12F5GT	.49
12J5GT	.39
12J7GT	.49
12K7GT	.49
12K8Y	.49
12Q7GT	.39
12SA7GT	.49
12SC7	.69
12SF5GT	.49
12SF7GT	.49
12SG7M	.69
12SH7M	.49

Type	Your Net Cost Each
12SJ7GT	.49
12SK7GT	.49
12SL7GT	.49
12SN7GT	.49
12SQ7GT	.49
12S8GT	.49
12SR7GT	.39
12Z3	.49
19	.49
19BG6G	.99
19T8	.49
2050	.99
2051	.49
22	.99
24A	.49
25A7GT	.79
25BQ6	.69
25L6GT	.39
25W4	.49
25Z5	.49
25Z6GT	.39
26	.39
27	.39
30	.39
32L7GT	.49
32	.59
33	.49
34	.49
35/51	.49
35B5	.39
35C5	.39
35L6GT	.49
35W4	.39
35Z4GT	.49
35Z5GT	.39
36	.49
37	.49
38	.49
39/44	.39
41	.49
42	.59
43	.59
45	.49
45Z3	.69
45Z5GT	.59
46	.49
47	.69
49	.59
50B5	.49
50L6GT	.49
53	.39
56	.39
57	.39
58	.49
70L7GT	.69
71A	.59
75	.49
76	.49
77	.39

Type	Your Net Cost Each
78	.49
80	.39
81	.69
82	.89
83V	.79
84/6Z4	.89
85	.49
89	.49
117L7/M7	.99
117P7GT	.99
117Z3	.39
117Z6GT	.69
1LA4	.69
1LA6	.79
1LB4	.89
1LC5	.69
1LC6	.79
1LD5	.65
1LE3	.69
1LG5	.69
1LH4	.79
1LN5	.65
3LF4	.79
7A4/XXL	.65
7A5	.65
7A6	.59
7A7	.59
7A8	.65
7AF7	.59
7AG7	.59
7AH7	.89
7B4	.59
7B5	.65
7B6	.65
7B7	.65
7B8	.79
7C4	.65
7C5	.49
7C6	.65
7C7	.65
7E4	.65
7E5	.65
7E6	.59
7E7	.59
7F7	.79
7F8	.89
7G7	.79
7H7	.79
7J7	.79
7K7	.79
7L7	.49
7N7	.79
7Q7	.59
7R7	.65
7S7	.65
7V7	.79
7W7	.79
7X7/XXFM	.65
7Y4	.39

Type	Your Net Cost Each
7Z4	.65
12A	.69
12A5	.49
14A4	.65
14A7	.49
14AF7	.79
14B6	.49
14C5	.59
14C7	.79
14E6	.65
14F7	.69
14F8	.79
14H7	.79
14J7	.79
14Q7	.49
14R7	.69
14W7	.89
35A5	.79
35Y4	.59
35Z3	.65
50A5	.79
50C5	.49
50Y6GT	.59
70A7	.99
VR105	.99
VR150	.69
807	1.29
954	.39
955	.39
956	.39
2051	.49
5516	4.95
9001	.39
9002	.39
9003	.39

ALL GLASS CATHODE RAY, TV TYPES. Standard RMA guarantee. 1st quality.

Type	Your Net Cost Each
7JP4	$16.88
10BP4	19.95
12LP4	24.95
15AP4	39.95
16HP4	38.95
16RP4 (rect.)	39.95

CATHODE RAY TUBES

Type	Your Net Cost Each
3FP7	$1.95
5FP7	1.95
5NP1	1.95

SPECIAL OFFER!
$34.95 per Hundred

1A4P	6AT6	6X4	25L6GT
1A6	6BA6	6X5GT	25Z6GT
1C6	6BE6	12A8GT	30
1F4	6BH6	12A6	35B5
1S5	6C4	12AU6	39/44
1T4	6C5GT	12BE6	53
1U4	6K6GT	12BF6	57
1U5	6SK7GT	12J5GT	77
3A4	6SQ7GT	12Q7GT	117Z3
6AQ5	6U7G	12SR7GT	6SD7GT

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1R4 12A6 14E6 1632 1643 2051 30 Spec.
45 Spec. 23D4 RK34 VR78 HY114B 841 843
864 954 957 E1148 9006

Following Types Are Priced As Indicated

Type	Price	Type	Price	Type	Price
2A5	$.88	6SC7	$.45	81	$ .55
2X2	.28	6Y6	.55	83	.59
5Z3	.55	7C5	.55	85	.45
6B7	.45	7Y4	.55	3B27	.89
6AQ5	.55	14A7	.55	RK72	.69
6BA6	.45	14B6	.55	RK73	.69
6C4	.28	14Q7	.55	3D08	1.19
6C5	.45	16Z5	.45	388A	1.19
6F7	.55	16Z6	.28	866A	.95
6G6	.55	70L7	.89	872A	.75
6C5	.35	78	.35	878	.89
				Tungar Rectifier	.89

Super Special No. 2

QUARTZ CRYSTAL CHECKER
(DUPLICATOR)

Manufactured by Finch Telecommunication. Housed in a hinged steel cabinet with 19" Panel, 9" High and 13½" Deep.

2 Meters mounted on panel, "0-1 Milliamperes" and "0-500 Cycles/Second."

Complete with tubes and power Supply.

2-VR105; 2-6J5; 1-6L7G;
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Crystal sockets mounted on front panel. **Sold as-is.** Instruction book not available.

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BRAND NEW GENERAL RADIO VARIACS

Type 200CU. Input 118 Volts, 50/60 Cycles. 5 Amps. Output fully adjustable from 0-135 Volts. Regular price $18.50. Your Price **$11.95**

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the duration of sync pulses, horizontal blanking, and other types of video signals.

Distribution of the "Microstick" is being handled by *RCA*, *RCA Victor*, and *Cunningham* Tube and Parts distributors exclusively.

FRINGE AREA ANTENNA

Brach Mfg. Corp. of Newark, New Jersey has developed a fringe area television antenna which combines a fan-type arrangement of elements for uniform high impedance and a Vee-beam alignment for a narrow high-gain lobe.

Known as the "6-Bar," the new unit eliminates the high-band drop off common to conventional conical types. The antenna comes preassembled from the factory so that with the new "Speed Rig" design installation is completed in a matter of minutes. All elements swing out into position and a few turns on easily accessible lock nuts mitre-lock them into a set position.

The low standing wave ratio of the antenna permits direct coupling to 72, 150, and 300 ohm transmission lines. The front-to-back ratio is said to be excellent under all field conditions.

—30—

Spot Radio News

(Continued from page 18)

General added, color receivers would also be available in about a year, with about 200 a week being made at the beginning, and perhaps 1000 a week as '52 rolled around.

A heated exchange of questions and answers followed the conclusion of the General's testimony, with Madame Commissioner Frieda Hennock particularly active on the firing line. Perturbed about the year-long schedule outlined by *RCA's* Board Chairman, the Commissioner indicated that others had said rapid production could be affected sooner, particularly for the other color method. The General replied that earlier production promises would be impossible to keep, regardless of the system adopted. He indicated that he wished the Commisioner had a bit of plant experience, and sat in on some of the day and night production-schedule conferences, which would reveal to her why processing must take time.

Criticizing the General's interpretation of the *CBS* pictures, which he had termed "degraded," the Commissioner said that she had found the pictures "beautiful." General Sarnoff retorted that the picture was "degraded," when compared to the electronic picture.

CBS witnesses who followed the General bombarded the hearing hall with bristling copy, Dr. Peter C. Goldmark roaring away with the bulk of the blazing commentary. Sharply criticizing the *RCA* minimization of registration problems, Dr. Goldmark said that the *CBS* system was the only one that had no registration to worry about either at the camera or receiver, while with the *RCA* approach, picture resolution could be cut to 25%, if the camera tubes were off one element. He also added that the *CBS* system provided complete fidelity, which involved faithfulness at a given point in the picture, uniformity over the whole screen and stability under home conditions, three conditions which he found the *RCA* system has not met. Blasting away at the availability testimony of *RCA* the *CBS* inventor said that equipment for his method could be produced in a few months, but he had "grave doubts" if the all-electronic gear could be manufactured even within the schedule submitted.

Goldmark also reviewed his experience with an *RCA* color receiver, declaring that he had operated a model in the home of FCC General Counsel Benedict P. Cottone, and found that the color and registration were poor, and that the picture also suffered from interference. In addition, he said that the color phasing control was very critical, often difficult to adjust.

Others from *CBS* and *RCA* appeared on the witness stand and continued to bounce rounds of sharp rejoinders about the session hall which burned many an ear. As these focal hearings concluded, official reaction to the hectic testimony appeared in pertinent addresses offered during luncheons and dinners by some of the Commissioners. In one speech by the Commission's Headman, Wayne C. Coy, before the City Club of Portland, a revealing review of the color and general television allocation situation was offered.

On the subject of color, Coy said that, . . . "All three systems have shown marked improvement since their first demonstrations. . . . There is no question but what the Commission's order stating that they would entertain proposals for color television has spurred the development of these techniques by months and years."

Analyzing some of the color questions which the Commission will have to answer, Coy said that they will have to consider how important it is to have a system whose color transmission can be received in black and white on existing receivers without the expense of an adapter. They'll also have to decide whether all of the systems should be allowed to be developed further. If the latter approach is taken, then the FCC will have to determine if the freeze can be lifted, or if it will be necessary to keep the freeze on until it is practical to write engineering standards for color.

If there were to be time for further experimental and developmental work, Coy wondered about the problem of obsolescence. The Commissioner said that they must decide if . . . "there is any action which, taken now, would protect the public presently buying receivers in a manner which would reduce the obsolescence factor, in the event the Commission decision favored a color system incompatible with present black and white standards.

"Given the assumptions I have stated," Coy added, "could it be expected that the television manufacturing industry would immediately build manual or automatic adapters in all television receivers? Would the relatively small cost for such an addition to a set be worth it in terms of giving the widest possible latitude for decision after further experimentation extending perhaps a year or more? . . . Or must we write multiple standards and let the public decide in the market place which is the better system."

Continuing his appraisal of the problem, Coy said that the . . . "kind of a television system we are working on now will be well worth waiting for. It will be a better service for the public, and a more stable, attractive enterprise for the broadcaster and the manufacturer."

Commenting on the lack of video facilities in some cities, Coy stated that he sympathized . . . "with any city that did not take advantage of its opportunities to start building television stations before the freeze. There was a period of about three years after the war when any city could have applied for and constructed all the stations allocated to it under the very-high allocation table."

Describing the future of television, the Commissioner said that . . . "Our coaxial and radio relay facilities to exchange programs between cities will be more than quadrupled this year. By the end of the year more than 40 cities will be bound together. These facilities are moving steadily westward. . . . In due time you will sit in your living rooms and look in on the opening of Congress. . . . And I will be sitting in my chair and seeing via television your industrial plants, the spectacular beauties of the Columbia River Highway, the Rose Festival and the skiing contests on Mount Hood. . . . I give you my pledge that *we will lift the freeze* at the *earliest practical date*, and that in all our planning we will insure that you will share fully and freely . . . in the exciting, challenging future development of American television."

A scintillating tribute to a sparkling industry and a heartwarming survey of what sight and sound techniques can offer to the people from coast to coast, Mr. Commissioner. . . . . L.W.

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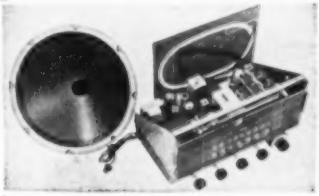

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T-24 Microphone for use with BC-222 . . . 1.50
HS-23 Headset with ear cushions—Excellent for use with the T-24 Microphone . . . NEW 2.45

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SCR - 522 TRANSMITTER - RECEIVER UNIT with tubes. EXCELLENT COND. $59.00
PLUGS—Set for SCR-522 (6 plugs) NEW 3.75
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NEW STEEL $1.95 COPPER 2.95

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BC-221 AJ and AK Frequency Meters . . . EXCELLENT USED 89.50
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APN-4 Indicator Scope—Excellent with tubes and crystal . . . $24.50
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. . . EXCELLENT USED 34.50
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SPEAKER—6" Compartment P.M. Weather-proof—25 Watts . . . EXCELLENT 7.75
TRANSFORMER—200-0-200 @ 50 ma.—6.3 V. @ 3 amps. 115 V. Primary . . . NEW 1.48
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Choke 8 hy 200 ma 97 ohms, fully cased 1.75

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2" 0-20 ma Basic	1.89	3" 0-3 amp DC	3.95
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50,000 ohm 1% WW Precis. Resist.	.6 for	.95
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Technical BOOKS

"TELEVISION COMPONENTS HANDBOOK" by A. C. Matthews. Published by *Philco Corporation*, Philadelphia. 156 pages. Price $2.50.

This handbook has been designed for the radio-television engineer, the student, and the service technician. It represents a compilation of reference data most often needed by those who work in the television field.

The book is divided into twelve chapters, an appendix, and index. The first chapter considers the general design of the various component parts and circuits used in the standard television receiver. Additional chapters deal with antenna systems and transmission lines; video, i.f. and r.f. transformers and inductors; power, audio, and deflection transformers and reactors; fixed and electrolytic capacitors; fixed and variable resistors; switches; insulating materials and components; miscellaneous television components; and vacuum tubes.

Much of the vital and frequently-used material has been tabulated for easy reference.

* * *

"OUTLINE OF RADIO, TELEVISION AND RADAR." A Symposium. Published by *Chemical Publishing Co., Inc.*, Brooklyn. 678 pages. Price $12.00.

This monumental work is a symposium prepared by eight outstanding authorities in the field of radio, television, and radar.

The book deals with the fundamental principles upon which radio, television, and radar are based, in addition to a discussion of the equipment required and the various applications of these basic principles.

Although the very size of the book might prove frightening to the tyro radioman, there is nothing awesome about the presentation of the material. The contributors have begun their discussion with the most elementary electrical theory and included brief but thorough coverage of such topics as the nature of electricity, how electrical energy is produced and used, and how electrical quantities are measured. After presenting this basic material the discussion turns to the nature of radio waves and broadcasting, consideration of such topics as resistances and potentiometers, chokes, transformers, condensers and capacity, inductance and tuning, and tubes. After a rather thorough discussion of these necessary circuit components, the various circuits themselves come in for careful scrutiny. The authors discuss r.f. amplification, the detector stage, a superheterodyne receiver, a.v.c., low frequency amplification, speakers, microphones, and pickups, power supplies for radio sets, and batteries.

The typical radio receiver circuit is explained and dissected and then short-wave and ultra-short-wave techniques are discussed. The cathode-ray tube and photoelectric cells next come in for their share of consideration. Finally the principles of television, radio direction finding, and a survey of radar are given.

* * *

"SERVICING TV RECEIVERS" by Sylvania Technical Staff. Published by the Radio Tube Division, *Sylvania Electric Products Inc.*, New York. 116 pages. Price $2.00.

This handy little spiral bound booklet contains an amazing amount of information on the servicing and maintenance of home television receivers despite the fact that it carries only 116 pages.

The material is arranged in such a manner as to be of maximum assistance to the service technician using the book. The manual is divided into various sections covering preliminary servicing measures, servicing precautions, a discussion on how television works, the test pattern, deflection circuits, antennas, the r.f. section, the video section, the sound i.f. section, low and high voltage supplies, the picture tube, set alignment, waveform notes, adjustment of the ion trap magnet and the focus coil, deflection yoke adjustment.

The book is well illustrated with actual test patterns, and oscillographs. A circuit diagram of a typical television receiver is also included. Distribution of this book is being handled exclusively by the company's authorized distributors.

—30—

THREE-DIMENSION TV

An Industrial television system, developed by Radio Corporation of America, which can be given a third dimension was revealed recently by Dr. V. K. Zworykin in an address before the Boston Section of the Institute of Radio Engineers.

By the application of special techniques, the system's usefulness can be extended to provide this type of reception in specialized applications with only a minimum of additional equipment.

In order to produce the stereoscopic effect, two cameras would be mounted side-by-side to view the object from slightly different angles. The TV signals, corresponding to the two offset scenes, would then be transmitted to two kinescopes, either through the air or by suitable cables. The separate images would be combined and viewed through special filters to give the three-dimensional effect.

Development of the industrial television system was first disclosed by the company at the IRE Convention in New York. Described then as the smallest and simplest system ever devised for non-broadcast, industrial television operations, it was explained that the system is based on a small and sensitive pickup tube known as the Vidicon. Although less than a tenth the size of the image orthicon tube, the Vidicon is able to attain high resolution at normal lighting levels. The tube is only one inch in diameter and six inches long.

—30—

Mac's Service Shop

(Continued from page 59)

"I was afraid of that attitude," Mac sighed. "That is why we are going to have us a little chat before I turn you loose on my customers. First, there is the matter of appearance. I never want you to make a house call unless you are wearing a clean shop coat, have your hair combed, and—"

"Don't worry about the appearance," Barney interrupted to reassure him. "A guy never knows when he is going to meet a slick chick on one of these service calls. Adolph Menjou will look like a tramp compared to Little Old Barney when he knocks at the door."

"Okay, but that brings up another point," Mac went on. "I want you to keep in mind that you are in the house to fix the customer's radio, not to entertain him or his good-looking daughter."

"You don't want me to be an old sour-puss, do you?"

"No, but neither do I want you to be the gabby sort that makes himself *too much* at home in the customer's house. If you really are thinking about what you are doing and doing it, there will not be much time left for idle chatter. I want you to act like a man whose time is important. Just remember how a doctor conducts himself when he calls on you. He may make a comment or so about the weather while he is taking off his coat or shaking down a thermometer; but outside of that the conversation is directly concerned with your particular complaint.

"After he has completed the examination and prescribed a treatment, he promptly puts on his coat and goes; but you do not mind his abruptness. In fact you are glad his time is important, for that means he has many patients, which, in turn, probably indicates he is a good doctor. The whole idea is to impress the customer with the feeling that you are not hurrying through his job at all but that your time is too valuable to be wasted in dawdling. See what I mean?"

"Yep, I get you. I'll develop a console-side manner like Young Doctor Malone."

"Manners are very important in house servicing," Mac said. "Keep in mind that the radio or TV set is probably located in the best-furnished room in the house, and see that you leave that room looking just as good as you found it. Always spread a square of clean canvas on the rug and place all of your tools on it. If the chassis must be pulled from a very dirty cabinet and you cannot help raking out some of the dirt with the chassis, request a newspaper that you can spread so as to catch the dust.

"Never leave a dirty empty cabinet when you bring the chassis and speaker to the shop, no matter how much the housewife insists she will 'take care of it.' The little hand vacuum cleaner in the truck is in-

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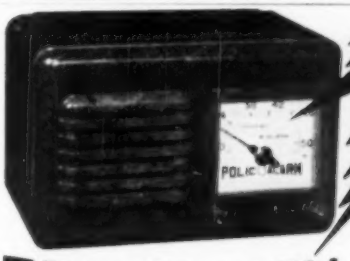

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tended just for that job. If the housewife is watching you remove the chassis, she will probably be embarrassed and apologetic when she sees the dirt inside the radio. Always compliment her on having had the good judgment to stifle her housewifely urge to make with the dustcloth inside the set. Point out to her that such dusting could be both dangerous to her and harmful to the receiver. She will love you for this."

"Do I make house calls at any particular time of day?"

"Usually we try to catch radio complaints in the morning. The housewife is more likely to be home then. Television calls, though, are always checked in the afternoon when the test pattern from Craddock City is on. Eventually we shall probably buy some sort of cross-hatch or dot generator so that we can have a test signal on the screen whenever we want it, but the amount of television servicing in this ultra-fringe area does not warrant that yet; so we have to depend on a broadcast test pattern for trouble analysis."

"How do I decide whether to fix the set at the house or to bring it to the shop?"

"If the trouble is not something that can be located and repaired quickly, make every effort to persuade the customer to let you bring the set into the shop. Point out that we have here hundreds of dollars worth of delicate, non-portable equipment that enables us to do a really thorough job of diagnosis and adjustment quickly—which, since we are paid for our time, means doing it at lower cost. Insisting upon having the receiver repaired in the home is just like asking a surgeon to perform a major operation on the kitchen table.

"About the only troubles that are repaired in the home are such matters as bad tubes, antenna and lead-in troubles, burned-out dial lamps, etc. An amazing number of TV and a.c.-d.c. radio complaints turn out to be tube troubles. Miss Perkins always tries to get the model number of the receiver from the customer or from our files when the complaint comes in, and then you use a tube-complement book or the service manuals to make sure you have all of the types of tubes you will need on the truck before you start out."

"Do I bring the whole set, cabinet and all?"

"Only when the radio is small, the cabinet itself is in need of repair, or the built-in antenna, record-changer, or other essential part needed for a complete service job is so difficult to remove that it is easier to bring the whole works. In that event, never try to carry a set that is too large or heavy for you to manage easily. I am not concerned about your back, but trying to handle a set that is too big is a good way to damage it or mar the cabinet. Just give me a call on the 'phone, and I'll come up and help you."

"You're so thoughtful of me!" Barney murmured. "Are there any other things I should know before I start

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stomping on the 'Welcome' mats?"

"A lot more than I can tell you at one time, but here are a few particularly important ones: Never say anything disparaging about a customer's set, even though you know it is an electronic stinker. Keep in mind that when you criticize the set you are also insulting the owner's judgment in buying it in the first place. If he asks what you think of the set, try to find *something* about it that you can admire, even though it is nothing more than the big figures on the dial. A character like yourself who boasts that he never has any trouble with his women should have no difficulty in this white-lie department.

"Watch out for children, too. If one burns himself on a hot soldering iron or a tube you have just pulled from the set, our name is mud with the mother. If you tactfully express worry that the child may be hurt, the mother will usually see to it that he is kept out of danger—and out of your hair.

"Always insist that everyone else leaves the room before you handle a video tube, and I had better never hear of your touching one of those tubes without wearing gloves and goggles. After the tube is removed, place it at once in a cardboard carton and leave it there until you are ready to put it back in the set. Never leave an old cathode-ray tube with the customer. Bring it back to the shop inside a carton so that we can destroy it safely."

As Barney listened, he was twisting and turning in front of the small mirror fastened to the back wall of the shop while he critically examined his reflection.

"Say, Boss," he suddenly exclaimed, "I am not sure these blue shop coats will do justice to my red hair when I start calling on the public. Now if you would change to green—"

He broke off with a start as a terrific roar shook the shop. It was only a clap of thunder, but from the agonized look on his face, it could just as well have been Mac's growl of protest.

—30—

"Do yez suppose des trunks are clean enough? I'm on television tonight!"

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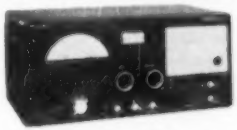

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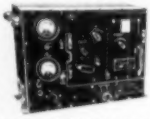

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PHONES: RE 2-8177 and WO 4-2915

Discount Those Bills

(*Continued from page 39*)

vert such funds to other shop expenses or for expansion. To do so places an interest burden on the shop. As a discount fund the loan carries itself and shows a net profit.

A reader may be puzzled by the fact that, apparently, suppliers can pay 18% to get the use of customers' money. He may reason that if such an interest rate is not excessive for the supplier to pay it should be no hardship for the shop owner. This misses the basic fact warranting cash discounts.

While, for all practical purposes, failure to take a discount amounts to the equivalent of an interest charge on the shop owner, it does not follow that the supplier is paying 18% (or discount) solely to get the use of the shop owner's money sooner.

The discount offered for prompt payment of bills is made possible by several circumstances. These are: (1) quicker recovery of money owed; (2) sharp reduction in credit risks and resulting credit losses; (3) elimination of collection costs, and (4) a decrease in bookkeeping and billing. These savings are simply passed on to customers in the form of a discount which rightly rewards *only* those customers who help to effect these savings for the suppliers.

Frequently, within the limits of good buying judgment, the shop owner may be able to make even larger earnings on funds by employing them for the purpose of quantity buying carrying quantity discounts. Too many shops struggle along with too small an inventory of parts, materials, and supplies in relation to their volume of business. This may be carried to the point where the shop operates inefficiently and uneconomically.

Certainly no shop, however large, can possibly carry a complete stock of every conceivable part that it may be called upon to supply for an orphan set. And this article does not so imply. Quite the contrary. But, on the other hand, there is entirely too much uneconomical hand-to-mouth buying of parts needed constantly by the shop. Lack of constantly used parts and materials results in (1) costly delays and loss of customer good will, (2) lost time of service technicians who may be idled by this, and (3) expensive re-ordering processes, as well as (4) higher unit costs of parts.

The shop owner, in essence, has only his own time and that of his employees to sell. If he spends an excessive part of that time in ordering parts on a hand-to-mouth buying basis as needed, either by letter or by phone, that is just so much productive time gone forever.

On the other hand, if he orders in quantities sufficient to carry him for a reasonable period of time, he cuts down on his unproductive time and, because a quantity is involved, earns a tidy bonus for his foresight. His attitude is one of *how much do I need to operate efficiently* instead of *how little can I get by with*.

Obviously the greater the volume of business the shop can do annually on a small *fixed average investment* in parts and materials the greater its net earnings will be on that *fixed investment*. This is the virtue of rapid turnover of inventory, provided a net profit is inherent in each turn. However, it can be carried to the point of diminishing return.

By carrying a larger inventory because of the inducement of quantity discount, a shop owner may not be able to boast of fast turnover of inventory. However, thanks to a somewhat larger investment in inventory, he may have a much more favorable net profit showing at year end.

Example: Assume a shop owner is now netting $4500 and is buying hand-to-mouth. He decides to take advantage of quantity buying discounts and, to do so, he must employ an additional $1000 in inventory. However, as a result of this, quantity discounts earn an additional $200 a year. This means his net shop earnings have jumped from $4500 to $4700 without any increase in volume. Moreover, the additional $1000 employed in the business has earned at the rate of 20% a year. That beats holding down inventory so that the shop owner can tie up $1000 in, say, a savings account paying 1½% annually.

While many shop owners are restricted in buying by limited capital, others arbitrarily hold down inventories long after they have reached a point where, with profit, they could employ funds invested outside the business. That is, having established an inventory norm tied to a lively turnover rate, they hold physical inventories at that point, even when quantity discounts offer lucrative rewards.

Accumulated shop profits are diverted to outside investments in the mistaken belief that the business has attained its maturity and can no longer profitably employ additional funds. Buying policies of the hungry days of the past dominate the owner's thinking, long after ample capital is available. At this point the shop owner has finally reached, by much personal sacrifice, the very position for which he has struggled for years. For the first time he is able to enter the market place with cash to talk terms.

Illustrating that quantity discounts

Table 2. Profit on investment on stock purchased in quantity at a quantity discount.

Stock Turns Annually	Annual Earnings on Quantity Discount Rates			
	3%	5%	7½%	10%
12	36%	60%	90 %	120%
8	24%	40%	60 %	80%
6	18%	30%	45 %	60%
4	12%	20%	30 %	40%
3	9%	15%	22½%	30%
2	6%	10%	15 %	20%
1	3%	5%	7½%	10%

are equally important with cash discounts and that quantity buying must be weighed against inventory turnover rates in wringing out a larger net profit from a shop, consider Table 2 showing the profit-on-investment in stock bought in quantity at a quantity discount.

Example: Assume a shop normally carries only a week's supply of certain items. By buying four times as much (roughly a month's supply) it can earn a quantity discount of 3% and still turn its inventory in these items 12 times a year. This means that on total money invested in inventory 36% earnings can be had on the investment. On the other hand, it would be pointless to buy a quantity of a certain part if the quantity were so large that it would take a year to work off the supply, where the discount were only 3%, as earnings would be only 3%.

Ideally, a combination of fast turnover and maximum discounts should be sought. In practice this must be a compromise between the two. A hard decision must be made between slower turnover and higher discounts, or lower discounts and faster turnover. That's where good judgment must be exercised.

By all means, the shop owner should give serious consideration to increasing inventory turnover as a means of increasing profits. He should constantly watch his stock and work off slow moving parts and materials which are tying up funds, and try to keep from getting caught with a large stock of obsolete parts for which there is a constantly decreasing demand. But, he should not attain fast turnover at the sacrifice of discounts which can materially increase over-all net shop profits.

In any event it is assumed that quantity buying will be the product of sound buying judgment with due consideration for market fluctuations. Otherwise, potential earnings inherent in quantity buying can be wiped out.

—30—

CHANNEL SWITCH REPAIR

By DOMENIC R. RIPANI, W9JAQ

An intermittent channel switch does not necessarily mean that the switch must be replaced. Since, at best, this is one of the most difficult of all television service operations, it should be done only as a last resort.

In many cases, particularly in General Electric Models 810, 814, etc., it has been found that the wiper arms of the switch do not hit directly on the contacts, but to one side. When the switch is new and there is plenty of tension this will not show up but as the switch becomes worn, the "off-center" contact results in intermittent operation.

A simple solution is to loosen the two nuts holding the wafer assembly and turn the switch arm until the contacts again line up properly. As an added precaution it is suggested that the switch be cleaned at the same time with a contact cleaning fluid in order to remove any foreign matter in the assembly.

—30—

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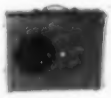

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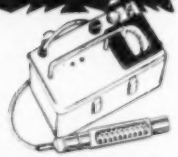

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Preamp

(*Continued from page* 38)

Recent standard *Columbia* records are reported to follow the NAB curve except that the low-frequency turnover is at 300 c.p.s.[3] The equalizer is illustrated in Fig. 6C; the lower turnover requires only a few changes in the NAB equalizer.

Victor 78 r.p.m. characteristic. Standard *Victor* pressings of recent date are supposed to have a low-frequency turnover of 500 c.p.s. and a treble pre-emphasis of 2.5 db. per octave beginning at 1000 c.p.s.[3] This treble characteristic is not as easy to correct as the previous ones but the equalizer of Fig. 6B does a fairly good job of it.

Decca FFRR characteristic. These English high-fidelity records have a low-frequency turnover at 400 c.p.s.; the treble pre-emphasis amounts to 3 db. per octave beginning at 3000 c.p.s.[4] The required equalizer is illustrated in Fig. 6A.

Equalizer construction. The equalizers themselves can be made very compact by utilizing half-watt resistors and the small paper condensers now being manufactured by several companies for use in miniature equipment. A number of equalizers have been constructed with 10 per-cent tolerance resistors and these condensers, and have been found in almost every case to follow the calculated curve quite closely.

To constuct the equalizers, the required condensers and resistors are assembled as illustrated in Fig. 4. The leads are soldered together and appropriately color-coded input, output, and ground wires are attached. A small glass vial, of about 8 milliliters capacity, is prepared by grinding off the bottom, resulting in a thin glass tube into one end of which a cork is fitted. This cork is pierced with a heavy needle and the equalizer ground wire is passed through it. The entire equalizer is now inserted into the prepared vial, care being taken to keep the bare leads from touching each other. The input and output leads project from the top of the tube. A label bearing the designation of the equalizer is rolled up and carefully inserted around the inside of the tube. Microcrystalline wax, preferably of the high-melting-point type (*Sunoco* 1290 yellow was found to be excellent) is heated to about 110° C. and poured into the tube; a certain amount of foaming occurs, which is caused by water vapor being driven off. The assembly is allowed to cool thoroughly, during which it may be necessary to add a little wax. The cork is carefully withdrawn from the bottom and the equalizer is removed by heating the tube and pulling the assembly out.

Made in this way, each equalizer is a neat unit resembling a standard tubular paper condenser in shape and size (Fig. 4). Shielding was unnecessary in the case of the preamplifier

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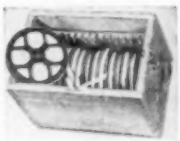

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described, but if desired it could have been accomplished simply by enclosing the unit in braided shield attached to the ground wire. The preamplifier has adequate space behind the equalizer switch for nine of these equalizers.

Switch positions not supplied with equalizers may be grounded. This will prevent open-grid howl when an unconnected position is passed. Switching from one equalizer to another has been found to cause no excessive surges in the amplifier; the switch is of the shorting type.

Conclusions

The preamplifier and associated equalizers described have been employed in conjunction with a *Clarkstan* RV cartridge and an amplifier having a flat response (± ¾ db.) from 20 to 20,000 c.p.s. Results have been very pleasing indeed for modern pressings and generally quite excellent with older recordings. It is too much to expect any amplifying system to supply what is lacking on a record, and the real test of the unit is with modern discs. With some late *H.M.V.* records, which are reputed to include up to 20,000 c.p.s.[3] the effect is astounding. Although the pickup used has the highest voltage output of any of the higher-quality units, no evidence of distortion from overload of the preamplifier tubes has been noticed. In short, the unit has economically and simply provided reproduction of the most satisfying quality and it is recommended particularly to the lover of fine music.

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4. *Hallows, R.: "Transatlantic News." Radio Craft, June 1947, p. 55.*

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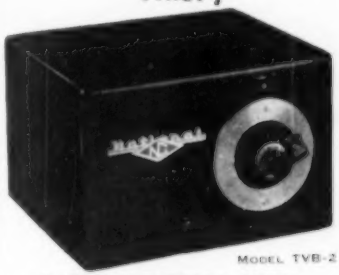

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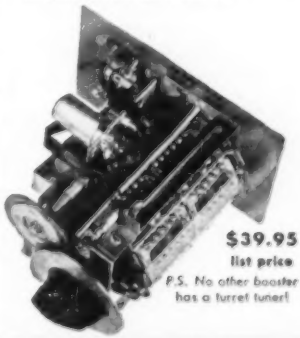

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83-1R	.28	83-22R	.48	UG-85/U	.62
83-1RTY	.45	83-22SP	.68	UG-87/U	.68

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Cap.	Wkg Volts	Price Each	Per 100	Cap.	Wkg Volts	Price Each	Per 100
.02	200	$.04½	$3.00	.1	400	$.09	$6.00
.05	200	.04½	3.00	.005	600	.04½	3.00
.1	200	.04½	3.00	.01	600	.07	4.75
.25	200	.06	4.00	.05	600	.08	5.50

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Sec. 6V. @	12½A	1.84	Sec. 7V. @	11A	2.34
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100 MA	.72	400 MA	1.51
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International Short-Wave

(*Continued from page 52*)

9.919 is a harmonic of Bogota, 4.960, "Radiodifusora Nacional de Colombia"; noted around 2258 with announcement, "Radiodifusora Nacional de Colombia en Bogota"; signed off suddenly at 2303; announced as operating in the 25-, 48-, and 62-m. bands s.w. and on 1200 kc. m.w. At the time this was compiled, Stark was hearing "La Voz del Valle," Cali, on approximately 6.135 around 2200-2303 sign-off; may have vacated 4.825.

HJCF, 5.964,Bogota, heard with musical program and announcements in *both* Spanish, *English* 2030; good level in New Jersey. (Oskay)

Czechoslovakia—Prague has dropped the 49-m. channel (6.010) for the summer; now is using 11.840 at 1245-1300, and 9.550 at 1445-1500, 1645-1800. (Radio Sweden) The 9.550 outlet noted in Nova Scotia 1745. (Baines) Currently has news 1245-1300 on 11.840; 1445-1500, 1645-1700 on 9.550. (Pearce, England)

Denmark—Copenhagen, 15.165, noted 1900. (Baines, Nova Scotia)

El Salvador—YSHQ noted on 6.170 at 2230-2259 sign-off; is San Miguel. (Stark, Texas)

England—BBC's programs for the Western Hemisphere are listed—Special regional programs, to Canada, USA, Mexico, 0915-1115, 17.79, 1200-1545, 17.79, 1445-1615, 15.14; to West Indies, 0700-0730, 17.70, 0700-0730, 15.11, 1200-1230, 17.70; 1815-1845, 15.18, 1815-1845, 11.75. General Overseas Service—To West Indies, Central America, South America (North of Amazon), 0945-1015 (Saturday), 17.70; 1215-1600, 17.70; 1600-1815, 15.18; 1700-1815, 11.75; 1845-2015, 15.18; 1845-2215, 11.75; 2015-2215, 9.58. To North America (West Coast), 1700-1915, 15.14; 1915-2215, 9.51. To South America (South of Amazon), 0600-0815, 21.71; 1100-1600, 21.71; 1600-2015, 15.26; 1700-2200, 11.80; 2200-2215, 9.51. To Canada, USA, Mexico, 0600-0800, 15.26; 1615-2015, 15.14; 1700-1845, 11.70; 1900-2200, 11.75; 2015-2315, 9.825.

Fernando Po—Does anyone have any recent information on the high-powered Spanish s.w. transmitters projected for this location?

Finland—Helsinki noted signing on weekdays 0700 on 17.800, 15.190, news 0715 announced as in 31-, 19-, 16-m. bands; at 0725 announces that a transcribed variation of the news for North America is radiated 2200 on 15.190. (Pearce, England) Callarman, Oregon, confirms that Helsinki, 15.190, does have a news bulletin at 2200 for the first 10 minutes of its daily 2200-2400 transmission; announces as operating in the 31-, 25-, and 19-m. bands (probably 9.556, 11.780, 15.190?).

France—I understand that Paris dropped its *English* transmission to North America 1945-2000 due to "budgetary reasons"; may be resumed soon.

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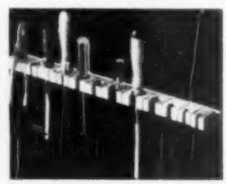

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WRITE FOR ILLUSTRATED CATALOG

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French Equatorial Africa.—Grove, Ill., has received this current data from *Radio Brazzaville:*

Uses 800 watts on 7.000, 21.000; 15.5 kw. on 6.024, 9.964, 17.840; 7 kw. on 9.440; 50 kw. on 11.970, 15.595.

Radio Brazzaville is scheduled 0000-0215—6.024 to local areas, 7.000 to local areas, 9.440 to Middle East, 9.964 to local areas, 11.970 to Europe; 0500-0720—6.024 to local areas, 9.964 to local areas, 15.595 to Middle East, 17.840 to Europe, 21.000 to Europe; 1100-1400—6.024 to local areas (opens 1210), 7.000 to local areas, 9.440 to Middle East, 9.964 to local areas, 11.970 to Far East; 1400-1600—6.024 to local areas, 7.000 to local areas, 9.440 to Middle East, 9.964 to local areas, 11.970 to Europe, 17.840 to *North America;* 1600-1800—6.024 to local areas, 7.000 to local areas, 9.440 to South America, 9.964 to local areas, 11.970 to *North America;* 1800-2030—6.024 to local areas, 7.000 to local areas, 9.440 to *North America*, 9.964 to local areas, 11.970 to South America. *English* news is scheduled daily 0015, 0515, 1100, 1315, 1550, 1745; Mailbag Program in *English* for Sunday after news bulletins at 0015, 1100, 1745; *English* talks are scheduled Tuesday, Thursday, Saturday after news bulletins at 0015, 1100, 1745. Portuguese news Mon.-Sat. 1515, Sun.-Fri. 1900; Portuguese talks Sunday 1315, Saturday 1900. Spanish news daily 2000 (in near future, probably by now); news in Danish 1500 on second and fourth Wednesday; Swedish news 1500 on third Wednesday; French at all other times, including news daily 0000, 0100, 0200, 0630, 0715, 1200, 1330, 1530, 1630, 2015.

French Morocco—Radio Maroc, Rabat, sent Cox, Dela., this schedule for its s.w. transmissions—Chain A, 6.006, 2.5 kw., 0145-0300, 0730-0930, 1515-1805; same channel, Chain B, 0300-0330, 0600-0700, 0700-0735, 1310-1515; Chain A, 7.214, 50 kw., 0800-0900 (may mean "Voice of America" relay at Tangiers takes relay from Rabat?).

French West Africa—Radio Dakar sent *new* type of QSL card for 19-m. reception; gave schedule on 11.895 as 0200-0300, 0700-0830, 1320-1800; on 15.340, 1400-1530. (Pearce, England)

Greece—Radio Athens is now radiating on 9.607 at 0000-0235, 0500-0630; on 15.345, 1015-1115, 1730-1830, and on 7.300, 1200-1335, 1400-1620, 1630-1645, says *Radio Sweden*. Another Greek station has been reported to *Radio Sweden* as heard on 7.635, 1200-1500.

Armed Forces Broadcasting Station, 6.745, Larissa, noted Thursdays with *English* 1530-1545. (Pearce, England)

Bluman, Israel, lists these schedules for Greek Regional outlets—Macedonia, 7.950, 0000-0100, 0600-0700, 1100-1530; Peloponnesos, 7.020, 0000-0100, 0600-0730, 1100-1430.

Guatemala—TGTO, 6.285, Guatemala City, noted recently 0025-0055; signs off 0115. (Callarman, Ore.)

Honduras—Balbi, Calif., has heard HROW, 6.02, *Radio Monserat*, Tegucigalpa, testing a *new Western Electric* 3 kw. transmitter 0320-0330; strong

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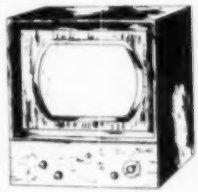

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signal; gave *English* announcements often, American recordings; frequency given in Spanish at 6.020.

India—Mysore's s.w. outlet is scheduled on 6.028 at 2030-2200, 0230-0400, 0700-1130. (Sampat, India) The *English* hour from AIR at 1400-1500 now has 1400-1410 to precede musical program; noted in England on 7.240, 9.620, 11.760, 11.850. (Pearce)

Indochina — "Voice of Vietnam," 7.265, Saigon, goes past 0730; news 0615-0630. (Stark, Texas) Saigon still noted on 11.84 with news 1000 but with QRM from LRT, Argentine; however, can be copied in Melbourne. (Sanderson, Australia)

Indonesia—The 7.100 Indonesian recently had moved up to 7.105; heard mornings. (Stark, Texas)

The *English* session 1000-1100 to Asia and the West Coast USA from Djakarta is now radiated on 15.150 and 11.770; has added to announcement, "and for South Africa." YDF2, 11.785, may open as early as 1100 with Arabic instead of former 1115. (Dilg, Calif.)

Djogjkarta's YDS, 5.070, heard to after 1000; YDQ, 9.550, YDQ2, 5.030, Makassar, sign-off 1000 after playing "Now Is the Hour"; YDI, 3.980, good strength in New Zealand to 1000 sign-off. (Cushen)

QRA for *Radio Djakarta* is Gambir Selaton No. 17, Djakarta, U.S.I. (Halvorsen, Norway)

According to a letter received by Dilg, Calif., from *Radio Djakarta* officials, prewar time zones have been restored making North Sumatra GMT plus 6:30 hours; South Sumatra, GMT plus 7:00; Java and Borneo, GMT plus 7:30; Celebes, GMT plus 8:00; Moluccas, GMT plus 8:30.

Iran—Radio Teheran noted on approximately 9.660 with news 1500-1505 followed by dance music (titles in *English*) to 1530 when said time was 2400 and end of two-hour broadcast of news and music which is on the air daily 2200-2400 Teheran Time (1330-1530 EST); has French news 1430, recordings 1440-1500 (*English* announcements). (Pearce, England)

Israel—QRA for "Voice of Zion" is P.O. Box 754, Jerusalem, Israel; schedule is 1430-1645 (1600-1645 in *English*) on 9.000; the North American Service has been postponed until the *new* 50 kw. transmitter is ready for operation later *this* year; new QRA of Kol-Israel is Broadcasting House, Jerusalem, Israel; this one is scheduled on 6.830, Tel Aviv, and 8.170, Haifa, at 2330-0100, 0200-0715, 0800-1515 (*English* at 0600, 1415) and is relayed over 9.000 at 1100-1430. (Bluman, Israel)

Studios of the I.B.S. are located in both Tel Aviv and Jerusalem; the *Eng-*

ADDITIONAL NOTES ON SQUARE-WAVE CLIPPER

("Wide Frequency Range Square-Wave Clipper" by Louis E. Garner, March 1950 Issue)

THE clipper circuit, as originally designed and built, was used as an incidental part of other experimental units. For this reason, extended experiments in other applications were not carried out. The audio signal source used was a very low impedance source. Because of this, square waves with a very flat top and sharp corners were obtained (the rise time, as is customary with clipped sine waves, is not extremely short), using the component values specified.

In the last few weeks, an opportunity has arisen to try the clipper circuit using a commercially available signal source which has a medium to high impedance output. The results were not too good; the negative-going portion of the square wave was not constant in amplitude, and the wave shape was far from being symmetrical. It has been suggested that another series clipper with reversed polarity and in parallel with the regular clipper be used. Generally, however, it is not necessary to go to this extreme as a change in the component values used suffices to correct this deficiency.

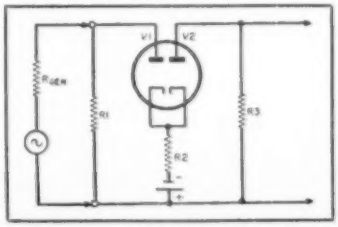
In accordance with Fig. 1, when V_1 conducts, R_1 is essentially in parallel with R_3 and the impedance presented to the signal source becomes lower. A voltage division occurs between the internal impedance of the generator, R_{gen}, and R_1 and R_3 combined, lowering the voltage applied to the clipper. On the negative half cycle, when V_1 is not conducting (signal voltage exceeds battery voltage) then an essentially higher voltage is applied to the clipper circuit. Hence the applied signal does not have equal amplitude positive and negative half cycles.

To correct this, when the clipper circuit is used with a medium or high impedance signal source, the size of R_1 should be dropped and the size of R_3 increased. When this is done, the change in impedance presented to the generator when V_1 stops conducting can be minimized, and more symmetrical square waves produced. It was found that R_1 and R_3 should be changed to about 4700 ohms and R_3 to 22,000 ohms, when the clipper is used with generators having an internal impedance of greater than 100 ohms, if best results are to be obtained.

In addition, it has been brought to the author's attention that there are some inexpensive audio signal generators available which use an electrolytic condenser to couple to the output terminal. This may cause a small d.c. voltage, in addition to the audio signal, to be available on the output terminals of the generator. If sufficient, this d.c. may interfere with the operation of the clipper. In such cases a large (from .5 to 4 μfd.) paper condenser should be connected in series with the input terminal of the clipper.

—30—

Fig. 1.



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1P23	1.50	864	.15
2B22	.75	923	.50
2C21	.35	1613	.49
2C26	.25	1624	.60
310A	5.00	1633	.75
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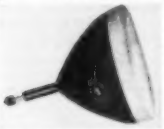

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lish program 1600-1645 on 9.000 is from studios in Jerusalem; transmitter is just outside Tel Aviv; a letter from station officials states that in going up to the third floor of the Jerusalem studios you can look out of the East Window and see Mount Calvary about 400 yards away in the Arab-held section. (Fargo, Ga.)

Italy—Rome, 11.81, noted ending news 2015; announced 9.630 was in parallel and asked for reports comparing reception on the two channels. (Stark, Texas) Rome noted 1410 signing on *English* program for Europe on on 11.81, 9.63; news 1430; noted another day 1355 ending news and program for South Africa (signs this period on at 1340). (Pearce, England) Bluman, Israel, reports Rome on 11.900 and 17.820 daily 0500.

Japan—The Radio Corporation of Japan sent a special greeting card commemorating its 25th anniversary on the air; said JKM had changed from 4.930 to 4.940; also that during summer, Daylight Savings Time makes programs now *one hour earlier*. (Pearce, England)

Kashmir—"Azad Kashmir Radio" has moved from the 60-m. to the 48.8-m. band; does *not* use *English*. (Sampat, India)

Malaya—Stark, Texas, and Dilg, Calif., believe *Radio Malaya's* Blue Network, Singapore, is no longer using the 7.250 channel.

Malta—FBS, 11.895, noted from 0430; at 1015 says closing on this channel, and suggests listeners retune to 7.270; still heard afternoons (EST) on 4.965 to closedown 1700; noted 0200 on 7.270 when said was closing on that channel to reopen 0430 on 11.895, 7.270. (Pearce, England)

Bluman, Israel, lists current schedules as to Africa on 4.965 at 2300-0200, 0830-1700; 7.270 at 0430-0815 (Sunday 0230-0815); to Egypt and Cyprus over 7.270, 2300-0200 (may be replaced by 6.140 if schedule can be worked out with Sharq-el-Adna to avoid QRM with ZJM4 on 6.135), and on 11.895, 0430-1015 (Sunday 0230-1015); at 1030-1700, FBS is still testing several channels. A third transmitter beamed on East Africa, for relay by FBS, Mombasa, Kenya Colony, soon will begin tests in the 13-m. band during Malta "daylight" time and on 25-m. Malta "evenings."

Mauritius — Forest Side, approx. 15.050, noted in Indiana with BBC news 2200; also seems to take BBC relay around 2230. (Leary) Pearce, England, reports he hears this one now usually to 1230 when signs off with "God Save the King."

Mozambique—Grove, Ill., says *English* programs from Lourenco Marques are scheduled 2300-0200 Mon.-Sat. on CR7BU, 4.932, CR7BJ, 9.766, and 11.764; 0000-0200 Sun. on CR7BU, 4.932, CR7BJ, 9.766, and 11.764; 0200-0930 daily on CR7BJ, 9.766, and 11.764; 0930-1000 daily on CR7BJ, 9.766; 1000-1100 daily on CR7BU, 4.932, CR7BJ, 9.766; and 1100-1600 daily on CR7AB, 3.490, and CR7BU, 4.932.

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415	431	445	481	496	508	522	376	386		393	404
416	433	446	483	497	509		377	387		394	405
418	434	447	484	498	511		379	388		395	408
419	435	448	485	503	515		380			396	409
420	436	462	487							397	411
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6040	6273	7873		5706	5940	6475	7406	7806
6073	6840	7905		5740	5975	6506	7440	8173
6075	6873	7925		5750	5940	6540	7473	8340
6100	6906	7973		5760	5973	6573	7506	
6106	6973	8240		5773	5975	6606	7540	
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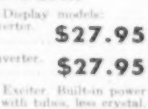

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The 3.490 and 4.932 channels noted in Australia around 1515-1530 with music. (Sanderson)

New Caledonia—Stark, Texas, believes the French-speaking station he hears on 6.037 around 0200-0552 may be *Radio Noumea* as reported from "Down Under" sources; noted leaving air 0552 announcing as "La Voix du France. . . ." QRN prevented good copying. Rosenauer, Calif., also reports this one.

Nicaragua—YNDG, Leon, still seems to be on 7.660; no tests noted on projected 5.990 channel. (Leary, Ind.)

Northern Rhodesia—Lusaka's ZQP is scheduled on 3.914 at 0900-1230; QRA is P.O. Box 209, Lusaka, Northern Rhodesia. (Radio Australia)

Norway—Oslo noted on a Sunday on 9.645 at 2100 with a 5-minute newscast, followed by talk in *English;* left air around 2115. (Cox, Dela.)

Pakistan—In its External Services, *Radio Pakistan*, Karachi, broadcasts a daily newscast at 1230 on 11.885; Western music is heard on 11.885 and 17.835 at 0300-0330 (*except* Friday), and daily on 11.885 at 1200-1230. *Radio Pakistan*, Lahore, is operating currently on 6.075; has a talk in *English* 1100 on Monday, Tuesday, Thursday, Friday, lasts 15 minutes. (Sampat, India) The 15.335 channel is good in Indiana 2100 with news. (Leary) The 9.645 outlet still has news 1015. (Rosenauer, Calif.)

The 17.83 channel noted 0210 with world and local news; 15.335 with news 2100; 11.54 with news 0700 (also on Dacca, 7.14). (Sanderson, Australia)

Philippines—DZI3, 6.110, noted 0500 with *English;* DZH3, 9.50, heard in *English* 0445; DYB2, 4.98, noted 0445 with music. (Sanderson, Australia). Davao, 3.950, is used for *educational purposes only*. DYH2, 4.980, Bacalod City, heard 0500; DYH3, 6.105, Cebu, signs off 1105, uses 250 watts; DZH3, 9.500, signs off 1105, uses 1 kw. and single-wire-fed antenna; DZH5, 9.690, 250 w., uses single-wire-fed antenna; DZI3, Republic Broadcasting Corporation, 6.110, heard from as early as 0500 to 1200 sign-off, lists power as 5 kw., relays DZBB on 580 kc. (Cushen, N.Z.)

Poland—Warsaw, 6.215, noted 1445 with news and usual interval signal, then music. (Sanderson, Australia)

Portugal — Lisbon noted back on 9.745, signing off 2032. (Leary, Ind.)

Sao Tome—The *Radio Club de Sao Tome e Principe* is reported again by *Radio Suceden* as heard with Portuguese music on 17.6775 at 0730-0800.

Saudi-Arabia—Mecca is now also heard with a "morning" period at 0030-0100; frequencies include 11.950. (Radio Sweden)

South Africa—ZRB, 9.110, Pretoria, noted signing off 0924, only fair level; Johannesburg, 9.523, noted 0955 with variety show in Afrikaans; Cape Town, noted on 9.6024 in Afrikaans on another day at 1105. (Triebel, Wash.)

Southern Rhodesia—ZEAH, 7.290, Salisbury, signs off 1500. (N.Z. DX Times)

Surinam—Paramaribo, 15.405, noted

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in Calif. 1830 to 2030 sign-off. (Russell)

Syria—Damascus not heard lately near 6.910; letter-verie states has moved to 41.9 meters; however, noted close 7.13 or 7.14; schedule given Thursdays 2345-0300 (Fridays), 0400-0800, 1100-1700; other days, 2345-0100, 0600-0800, 1100-1700; *English* news 0600-0610, 1630-1640; *English* musical program 0430-0500; French 0610-0620, 1640-1650 (news); French musical program 0500-0600. (Pearce, England) Bluman, Israel, says Damascus has been testing some days on 9.550, other days on 7.145, in parallel with 6.000 and 12.000.

Tahiti—Radio Tahiti, 12.080, 6.982, Papeete, now has *English* announcements 2330-2345 and requests for details on the scenic attractions of the islands are referred to the nearest French Consul or direct to P.O. Box 478, Papeete, Tahiti. (Cushen, N. Z.)

Taiwan—BCAF, 8.99, National Chinese Air Force Station, noted 0715 with recorded program of Western music followed by news in Chinese. (Sanderson, Australia)

BED7 moved from measured 7.1515 to measured 7.1488; news heard 0615. (Oskay, N. J.) Balbi, Calif., reports BED3, 15.235, has replaced BED4, 11.725, for the 2300-0100 beam (first hour in *English*) to USA; signal is poor, QRM'd by Tokyo.

Tangier—Radio Africa, 7.090, noted in French and with music 1730-1800. (Sutton, Ohio)

Thailand—HS8PD, 6.241, Bangkok, noted 0940 with oriental music, weak signal. (Triebel, Wash., via URDXC) HSJ4, 15.91, noted 0500 with music; news at 0545. Thailand also heard some time ago on approximately 12.04, not on regular schedule, but at times had news 0545 and 0615; signal quite fair in Melbourne. (Sanderson, Australia)

USA—Summer schedules for "Voice of America" s.w. relays overseas are—6.060, Tangier-1, 1700-1730 to Europe; 6.080, Munich-3, 1045-1715 to Europe; 7.214, Tangier-1, 0800-0900 to North Africa (RDF); 7.250, Munich-4 1045-1715 to Europe; 9.530, Manila-3, 1800-2000 to East Asia; 9.540, Munich-2, 1045-1715 to Europe; 11.790, Honolulu-1, 0400-0915 to East Asia; 11.790, Tangier-2, 1500-1715 to Europe; 11.870, Munich-1, 1430-1730 to East Europe; 11.890, Manila-1, 0400-1045 to Far East, 1645-1700 to Korea, 1800-2000 to East Asia; 15.210, Tangier-1, 1215-1630 to East Europe; 15.250, Tangier-2, 1100-1500 to Europe; 15.250, Manila-2, 1645-1700, 1800-2000 to East Asia; 15.280, Munich-1, 1100-1245 to East Europe; 15.330, Manila-2, Tue.-Sat. 0215-0300 to Southeast Asia, and Manila-1, Tue.-Sat. 0300-0345 to Southeast Asia, and Manila-2, 0400-1045 to East Asia; 17.780, Manila-3, 0400-1045 to East Asia; 17.800, Honolulu-1, 0215-0345 (Tue.-Sat.), relaying United Nations to Philippines-Southeast Asia; 21.570, Manila-2, 1535-1545 to Southeast Asia.

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Aircraft Radio Test Equipment—VHF
WI10B Field Telephone Wire—2 cond. twisted
TBS Shipboard Antenna—60-80 mc
A-101 Ground Antennas—100-156 mc
A-104-A Aircraft Antennas—100-156 mc
AN/ARN-7 Automatic Radio Compass 100 kc—1750 kc
ARC—1 VHF Aircraft Radio 10-20 channel—100-156 mc
ARC—3 VHF Aircraft Radio 8-32 channel 100-156 mc
SCR-284A Portable Field Radio 3.8—5.8 mc
TDE-2 Shipboard Transmitters—300 kc—18 mc
TCS Ship Shore Radio—1.5—12 mc
TAJ Shipboard Transmitters—175-600 mc
TBL Shipboard Transmitters—175-600 mc
TBK Shipboard Transmitters—2-18.1 mc
TBS Ship Shore Radio—60-80 mc
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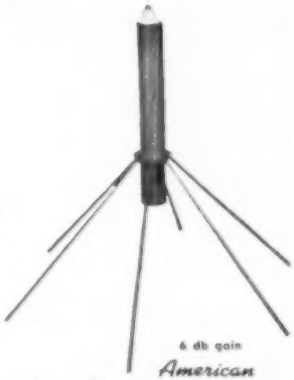

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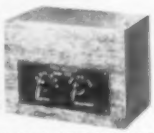

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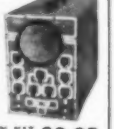

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summer schedule of *English* programs to North America for 1820-1930, 2000-2100, 2130-2300 on 15.23, 15.11, 11.96, 11.71, 9.69—with 15.18 and 11.82 added for the last two periods. However, Moscow is heard also on a number of other (unannounced) channels during these transmissions.

Vatican—Bluman, Israel, informs me that the *new* 100 kw. transmitter for the Vatican will *not* operate on s.w. but on m.w. 1529 kc.

HVJ noted on a Saturday on 15.12 at 0215 with program to Australia-New Zealand (news). (Sanderson, Australia)

Venezuela—YVOA, 4.830, San Cristobal, "*La Voz de Tachira,*" noted 2030 in Texas. (Stark)

* * *

Last Minute Tips

Pearce, England, airmails me that "This is Rhodesia Calling from Salisbury" is heard from around 1215 (sign-on believed 1100) on approx. 4.880 when relays "Radio Newsreel" from the BBC, London; time given as 7:15 p.m. Southern Rhodesia Time; news from BBC 1300; weather report, local news, sports, South African news to 1330; signal deteriorates after 1400 but on one occasion was heard to 1505 when signed with "God Save the King;" man and woman announcers.

Verie-letter from *Radio Douala,* French Cameroons, stated frequency is 9.150, on air daily 1430-1515, 600 watts, antenna is delta pointed NW-SE. (Oskay, N. J.)

The 15.196 transmitter of Lourenco Marques, Mozambique, is CR7BG, 10 kw. (Radio Sweden, others)

Tentative schedules for *Radio Sweden* for July 31-October 29 will be 1900-2030, 10.780, 15.155; 0015-0230, 6.065, 15.155; 0230-1015, 11.705, 15.155; 1015-1700, 6.065, 10.780; usually has breaks on weekdays 0230-0600, 0900-1015. (Skoog, Sweden)

Pearce, England, and others have noted Rome on approximately 11.890 in parallel with 11.81 and 9.63 at 1340 when carrying news for South Africa; also noted mornings (EST) in Italian in 16-m. band; these do *not* seem to be harmonics. I noted the 16-m. outlet on approximately 17.835 one day at 1340 with news.

A verie-letter from *Radio Tirana,* ZAA, Albania, gives frequency of 7.850, schedule 1230-1600; measured recently as 7.8455. (Oskay, N. J.)

Emisora Radio Menorca, Mahon, 7.550, Menorca, noted signing on 1430; is now heard to 1700 sign-off with singing of a National Marching Air. (Pearce, England)

A letter from Makassar states YDQ2, 10 kw., 9.550, is scheduled 1700-1900, 2300-0100, 0400-1000; YDQ3, 3 kw., 11.084, at 0500-1000, 1700-1800; asked for more reports to Radio Republik Indonesia Serikat, Studio Makassar, Stanweg Zuid 2, Makassar, U.S.I. (Oskay, N. J.)

Radio Tahiti, Papeete, has informed Rosenauer, Calif., that work is under way on a powerful station which may be in operation *later this year* for

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longer and more frequent transmissions on various wavelengths. The installation also will be used for radiotelephonic communications from Papeete to France, USA, New Zealand, Australia. Said rhombic aerial for 12.080, 600 watts, is directed on San Francisco and Paris; gave no data on the 6.982 outlet.

* * *

Press Time Flashes

Laubscher, South Africa, flashes that "Springbok Radio" is now on the air with "C" (commercial) programs at 2345-0145, 3.356; 0145-1000, 7.295 (Sunday from 0100); 1000-1600, 3.356 (Saturday to 1700); power is 5 kw.; programs are all sponsored, mostly in *English* although about 1½ hour daily is in Afrikaans; regular SABC schedules are still unaffected, but as soon as new high-quality land lines—now under construction—are completed to connect Johannesburg, Cape Town, and Durban for better service, the "morning" and "afternoon" breaks will be filled from these centers. With the opening of "Springbok Radio," SABC began to issue a program magazine called "*Radio*." ZRB, 9.110, Pretoria, is now relaying "Springbok Radio" but programs are still interrupted for weather and other reports of use to flyers.

Kemna, Mo., reports *Radio Nigeria* heard on 9.60 at 0115-0200, excellent, in clear, relaying BBC's General Overseas Service.

Singapore's Blue Network on 7.250 is again audible in Calif. and still parallels the approx, 7.200 outlet. Communist-Chinese noted on approx. 6.650 around 0730, may be Hankow (?); another one noted on approx. 8.005 around 0830. (Dilg, Calif.)

Prague has inaugurated a new schedule to North America; noted and widely reported on 11.840 and 15.230 at 2100-2200 and (repeat) 2230-2330; announced a *new* transmitter is in use, presumably on 11.840 which is a "powerhouse" signal in East late evenings (EST); news 2100, 2230.

ZL4, 15.28, Wellington, N.Z., noted in N.C. 2200. (Ferguson) ZL3, 11.78, good in Calif. 2400. (Winch)

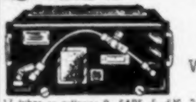
BED3, 15.235, Teipeh, Taiwan, noted 2300-0100 (first hour *English*); very poor signal. (Balbi)

TIPG, 9.618, San Jose, Costa Rica, noted weekdays with *English* program 1930. (Mulvey, Conn.)

Radio Continente, Caracas, Venezuela, notified Lane, South Dakota, that it recently moved from 5.030 to 5.040 at request of FCC. Said most reports are from Sweden, England, Australia, New Zealand; is beamed east-west to cover interior of Venezuela. Does *not* have printed QSL cards but sent nice letter, confirming reception of YVKM, 5.030; also listed YV5RY, 3.380; QRA given as Radio Continente, Bolsa A Padre Sierra 22 (Altos), Apartado No. 866, Caracas, Venezuela.

Nairobi, 4.851, Kenya, has been putting in a good signal in England around 1245; at 1300 announces "This is Nairobi," and then relays BBC news

SAVE UP TO 95% SENSATIONAL SURPLUS VALUES!



BRAND NEW APS-13 WARNING RADAR

17 tubes as follows: 9—6AB5, 5—6J6, 2—2D21, and VR-105, 410 to 420 Mc. and 30 Mc. IF. Good deal for conversion and citizen band. With instruction book. Originally over $100 ... $16.16

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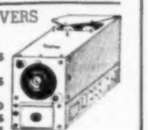

190-550 KC Used. Orig. $40. Now	$9.95
3-6 MC Used. Orig. $30. Now	4.95
3-6 MC New. Orig. $35. Now	6.50
6-1.9 MC Used	7.95
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BC-1068 RCVR 150-210 Meg. Contains 115 V AC 60 Cy. power supply. Inductance tuning for RF, Ant., DET and OSC. Makes ideal FM or 2 meter rcvr. with few modifications. Has 14 tubes: 1—6SN7, 1—6H6, 3—6SH7, 3—6AC7, 2—6AB7, 1—6J5, 1—5U4G, 1—9006, 1—6E5 ind. Used ... $22.50

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BC-459, 7-9.1 Mc. Excell. Cond.	$8.95
T-22 ARC-5 7-9.1 New Orig. $50. Now	12.75
3-4 MC. Used. Orig. $50. Now	12.50
5.3-7 MC. Used. Orig. $30. Now	3.95
T-21 ARC-5 5.3-7. New. Orig. $40. Now	5.95
4-5.3 MC. Used. Orig. $30. Now	3.49
T-20 ARC-5. New. Orig. $40. Now	6.95
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BC-1072 XMITTER

157-187 MC. Input 117VAC 60 cy. Has parallel rod OSC using 2—826 PP, contains power supply, general radio variac 1.5A. 3½" 0-5 kilovoltmeter, 10 tubes and loads of other parts too numerous to mention. With tubes. Less Blower. Used ... $19.75

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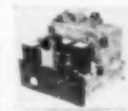

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Receiver tunes from 2.3 megs. to 6.5 megs. using 1 RF stage. Power requirements 90 V and 1.5 V. Transmitter tunes from 3.5-6.3 megs., phone or CW using 6V6ECO, 6V6PA, and 6V6 modulator. Uses 100 mil. plate meter and 0-1 amp. RF ammeter. Power requirements 300 V 100 mil. Excel. used cond. with tubes and receiver dry battery ... $39.95

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Xmitter or Rcvr. Separate ... $14.95

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WAVEMETER SECTION: has high quality resonant cavity tuning from 150-210 MC, oscillator, heterodyne amplifier, electric tuning eye, precision millen gear drive and collapsible antenna. Built-in oscillator checks against cavity for proper frequency setting. Uses 90 2, 6SF5 and 6E5 tubes. Used ... $14.00
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TRIPLETT #1183-SC COMBINATION TUBE AND MULTI-TESTER

Checks tubes, AF output, measures AC, DC volts, direct current, resistance, cap. Can be used as free-point tester for measurements at tube sockets while radio is on, without removing chassis from cabinet. 0/10/50/250/500/1000 AC, DC volts. Ohms/volt: 10,000 DC, 2000 AC. DC MA 0/1/10/50/250. Ohms: 0-500-15,000. 0-1.5 or 15 megs. Used good condition. Part of I-56C test set ... $49.50

LAVOIE VHF FREQ. METER. Type 105SM Tunes from 375-725MC. .1%. Brand new. Complete ... $59.95

ARC-5 VHF SET

R-28 RCVR: Superhet operating on 4 xtal channels 100-156 Mc remote control to actuate turret-tuning mechanism. 12 tubes—4—717A, 1—12A6, 3—12SH7 and 2—12SL7GT w/dyn. Originally $65.00.
MD-7 MODULATOR: Contains all necessary circuits and components for plate mod of T-23 Xmitter, w/dyn. which supplies plate and screen voltages for xmit. Used. Originally $38.00.
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COMPLETE SET OF THREE UNITS, USED $42.50

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from London. *Radio Clube de Cabo Verde*, Cape Verde Islands, will shortly increase power from 300 watts to 1 kw. HVJ, Vatican, has new studios under construction for its Overseas Services. Now that Moscow has changed to summer schedules and is no longer using 6.090, *Radio Luxembourg* is heard well on this channel in all parts of Europe; *English* is Sundays 1530-1800, weekdays 1700-1800; all reports on *English* periods should be sent to Radio Luxembourg, 36 Davies St., London, W.1, England. (Patrick, England)

I have just learned from "Down Under" that *Radio Australia* is now being operated by the Australian Broadcasting Commission; by this time *new* schedules will have been effected; it is likely that the 1643-1815 beam to Eastern North America over VLA6, 15.220, will have been discontinued by now, and that "morning" programs to North America will be over the 100 kw. transmitter, VLB, on 9.540 at 0700-0900 to East Coast; 0900-1000 to Central and Mountain Zones, and 1000-1115 to West Coast.

The Far East Broadcasting Company, Manila, currently operates DZAF, 680 kc., DZH6, 6.030, and DZH7, 9.730, in parallel; DZH6 heard in Calif. 0730-0900 sign-off, fair signal; DZH7 completely covered by QRM. (Rosenauer)

Radio Teheran, 15.100, noted with news daily 1500; excellent signal. (Bellington, N. Y., Fargo, Ga.)

Helsinki, 15.19, noted with news daily 2200, 0715. (Bellington, N. Y.)

Kol-Israel heard on 9.000, 8.17, 6.83, all weak, opening 2245. (Bellington, N. Y.)

Programs from Saudi-Arabia are broadcast only from Djedda at present but soon the main portion will originate in Mecca; operates on 3.960, 5.985, 9.645, 11.760, 11.950 and a m.w. channel; output is 3 kw.; scheduled 0030-0100, 1200-1330. (Radio Sweden)

Summer schedules of Djakarta, received direct from the station, are—0600-0700 *English*, YDC, 15.15, to Australia, New Zealand, and YDB2, 4.91, to Malaya; 0700-0800 Chinese, YDC, 15.15, to China, YDB2, 4.91, regional; 0800-0900 *English*, YDC, 15.15, to China; 0900-1000 Hindu-Urdu, YDC, 15.15, to India and Pakistan, and YDB2, 4.91, regional; 1000-1100 *English*, YDC, 15.15, to India, Pakistan, Burma, and YDE, 11.77, to West Coast USA and South Africa; 0930-1030 Indonesian, YDF, 6.045, to Southeast Asia; 1100-1200 Arabic, YDF2, 11.785, to Middle East, and YDC, 15.15, to Near East; 1200-1300 French, YDF2, 11.785, to Near and Middle East, and YDC, 15.15, to Europe; 1300-1400 Dutch, YDF2, 11.785, to Europe and New Zealand; 1400-1500 *English*, YDF2, 11.785, to Europe and New Zealand; 0800-0900 Arabic, YDB2, 4.910, to Indonesia and Malaya; 1030-1130 French, YDB2, 7.270, to Indochina, and YDB2, 4.910, regional. QRA given as Gambir Selatan No. 17, Djakarta, U.S.I. (Dilg, Calif.)

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just chosen Irving R. Potts again as president for the coming year; others named include Albert Sauerbirer, executive secretary; Benjamin Feinstein, assistant executive secretary; Walter L. Townley, treasurer; G. Dudley Clarke, Canadian vice-president; and Peter J. McKenna, Louis Hahn, Harold Robinson, Lester W. Kraemer, Henry T. Tyndall, Lloyd J. French, Charles S. Sutton, John W. Reichert, Earl R. Roberts, LeRoy Waite, Charles U. Atherton, and Jack D. Rhea, vice-presidents.

CR7BV, 4.932, Lourenco Marques, Mozambique, heard in Newfoundland 2300-0000 in parallel with CR7BE, 9.755, CR7BH, 11.764. (Peddle)

Radio Pakistan, 15.335, does *not* give location at newscast 2100 but says "simultaneously operating from Karachi, Lahore, and Dacca." (Cox, Dela.)

YNEQ, 6.963, Nicaragua, noted 2230-2300, good quality. (Saylor, Virginia)

Radio Trinidad, 9.625, sent schedule of 0500-1300, 1600-2200. (Baines, Nova Scotia)

Finally, here are tips received airmail from Serrano, Brazil—from listening, complete schedules for SRI programs from Buenos Aires are LRY, 9.455, 1545-1645 (except Sun.) Spanish, 1710-1750 Italian, 2115-0100 *English*; LRS, 11.88, 0900-1200 Portuguese, 1200-1300 German, 1300-1400 Swedish, 1400-1600 *English*, 1600-1800 French, 1800-2200 Portuguese; LRU, 15.29, 1215-1330 *English*, 1330-1445 (except Sun.) Spanish, 1445-1545 Italian, 2100-0100 (Sat. 2200-0100) Spanish. *Radio Ministerio da Educacao e Saude*, Rio de Janeiro, has returned to PRL4, 9.77, 1 kw.; scheduled 0330-1200, 1500-2130; verifies all reports, may be sent in Portuguese, *English*, French, or Spanish, and an IRC is appreciated; *new* s.w. transmitters are under construction for this station, more details expected soon. A license to operate on s.w. has been issued to *"Emissora Continental"* at Niteroi, capital of the State of Rio de Janeiro; no further details yet available.

* * *

Acknowledgement

Thanks for the FB cooperation. Keep it up, please!.....KRB.

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Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
1A5	$0.57	5Y3GT	$0.39	6C6	$0.55	6SN7GT	$0.53	12Q7GT	$0.50	35L6GT	$0.47
1A7GT	.57	5Z4M	.86	6D6	.59	6SQ7GT	.39	12SGT	.72	35W4	.39
1B3GT	.82	5Z3	.48	6E5	.39	6T8	.79	12SA7GT	.46	35Z4GT	.39
1B4P	.39	6A7	.69	6F5GT	.39	6U7G	.59	12SF5GT	.52	35Z5GT	.39
1C5GT	.70	6A8G	.56	6F6GT	.41	6V6GT	.46	12SF7GT	.53	36	.39
1C6	1.05	6AB4	.52	6F7	.39	6W4GT	.47	12SJ7GT	.49	37	.39
1C7G	.39	6AC5GT	.77	6F8G	.39	6X4	.39	12SK7GT	.44	38	.39
1F4	.39	6AG5	.56	6H6GT	.45	6X5GT	.39	12SL7GT	.61	39-44	.39
1G4GT	.39	6AK5	.87	6J5GT	.39	7A7	.59	12SN7GT	.53	41	.59
1H5GT	.45	6AL5	.43	6J6	.70	7B6	.59	12SQ7GT	.39	42	.59
1H6G	.39	6AQ5	.46	6J7GT	.49	7C4	.49	12SR7	.49	45Z5GT	.48
1N5GT	.57	6AR5	.40	6K5GT	.60	7C5	.59	12Z3	.39	46	.39
1P5GT	.86	6AS5	.47	6K6GT	.39	7F7	.59	19BG6G	1.53	47	.39
1R5	.55	6AT6	.39	6K7GT	.49	7Y4	.49	19T8	.77	50B5	.47
1S5	.46	6AU6	.46	6K8GT	.59	12AL5	.43	24A	.59	50C5	.47
1T4	.56	6AV6	.47	6L5G	.39	12AT6	.39	25A7GT	2.02	50L6GT	.47
1T5GT	.86	6BA6	.44	6L6G	.78	12AT7	.72	25AC5GT	.87	53	.39
1U4	.55	6AW6	.65	6N6	.90	12AU6	.48	25BQ6	.85	55	.39
1U5	.45	6BA7	.59	6P5GT	.55	12AU7	.58	25L6GT	.47	56	.39
1V	.39	6BE6	.46	6Q7GT	.50	12A8GT	.59	25W4GT	.47	57	.39
1X2	.68	6BF6	.40	6S7	.72	12AV6	.39	25Z5	.41	58	.39
2A7	.69	6BH6	.57	6SA7GT	.46	12AX7	.61	25Z6GT	.39	70L7GT	1.11
2X2	.69	6BJ6	.48	6SC7GT	.59	12BA6	.44	26	.50	75	.59
3A4	.39	6B5	.59	6SD7GT	.56	12B4	.59	27	.39	76	.59
3A5	.39	6B8	.39	6SF5GT	.52	12BE6	.46	30	.39	77	.39
3Q4	.62	6BQ6	.85	6SF7GT	.59	12BF6	.40	32L7GT	.91	80	.39
3Q5GT	.65	6BG6G	1.35	6SH7GT	.39	12J5GT	.40	33	.39	117LM7GT	1.11
3S4	.59	6C4	.39	6SJ7GT	.44	12J7GT	.55	35/51	.55	117P7GT	1.11
3V4	.60	6C5GT	.48	6SK7GT	.44	12K7GT	.47	35B5	.47	117Z3	.40
5U4G	.39	6BC6	.51	6SL7GT	.61	13KB8T	.49	35C5	.47	9002	.39

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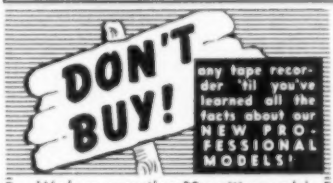

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Used, top cond. $22.50
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R-9A/APN-4 RECEIVER AND POWER SUPPLY. Companion to above indicator. Converts to 60 cy. operation for 160 meter, 4 chan. recr. or high voltage power supply for scope. Used. Complete with tubes $7.95

REMOTE SCOPE. Indicator ID-41/APQ-13. Radar PP1. 5FP7. Scale illumination, focus, brightness, vert. and horiz. cent. controls. 6AK5 tube and input circuit. Ranges are 4, 10, 20, 50 and 100 nautical miles. Plastic scale can be rotated against fixed compass calibration. In stepped cyl. container with selsyndriven coils. With selsyn. Cords attached to junction box.
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BC-788 and I-152 ELECTRONIC ALTIMETER. Can be modified for boat and aircraft use. TV and other VHF uses. Freq. range 440 MC plus-minus 20 MC. Six stage 30 MC IF strip. Xtal controlled tuning osc. Uses 3—6J6, 1—5Y3, 1—6L6, 9—6AG5 and xtal. Used; good cond. $22.50

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Red and Black plug. Nearly new cond. Individually boxed $1.75
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BC-906 Frequency meter. Range 150-225 MC. For upper TV channels or other uses. Easily modified for lower TV channels. Contains 0-500 DC Micro-Ammeter. Operates on simple DC power (1.5V and 45V). Hand calibrated tuning charts. Precision vernier dial. Diode-Triode tube. Complete with aluminum carrying case (12½"x8¾"x6½") and plug-in antenna. In original wood case. Price slashed to only $11.95

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APN-1 ALTIMETER TRANSCEIVER. 418-462 MC FM. Easily modified for citizens band use. Complete with 14 tubes and dynamotor. Sensational value at $6.95.
Now reduced for immediate clearance $4.95

BC-929 INDICATOR SCOPE. What a buy! Indicator for APN-2. Also for use as over modulation indicator. Contains 8 tubes: 1—3BP1, 2—6SN7, 1—6G6, 2—6H6, 1—2X2 and 6X5. First class condition. Wonderful deal for inexpensive test scope $12.95

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TV ENGINEERS

SN7/APQ-13. Outstanding value! Contains 19 MC IF strip with 5—WE717A tubes. Other HF strips containing 2—6SN7's, 2—6L6's, 1—6H6, 3—AC7's, 2—6AG7's, 1—6V6. Total of 26 tubes! Other parts such as DPDT relay, 7 pots, 12 Amphenol 83-1R chassis connectors, condensers, toggle switches, RF chokes, Var. condensers and transformers only $14.95

PP-72/APQ-7. Contains 20 tubes: 6—5R4GY's, 1—6L6GA, 6—6V6GT's, 3—6SL7GT's, 2—VR105's, 2—VR150's, 1—24V blower and motor (may be operated on 110V AC 60 cycles). Numerous power resistors, HV transformers, condensers, jacks, cannon connectors, etc. Wt. app. 40 lbs. Metal case $16.95

TRANSMITTER VALUE!

BC-689A TRANSMITTER. Operates about 300 MC. Wonderful possibilities for citizens band and 420 MC use. Consists of PP8012 long line oscillator and 10 other standard tubes, plus pots, ceramic sockets, condensers, resistors. Complete in aircraft type case. A lucky buy for us—a real steal for you! $9.88

JACK BOX. Complete with head phone set adapter to match high to low impedance 89c

R89/ARN-5 RECEIVER. Glide path receiver. Broad band pass. Xtal controlled local oscillator. 2-7 MC IF's. Complete with 7—6AJ5, 1—12SR7, 2—12SN7, 1—28D7, relays, xtals. Down goes price to $4.50

BC-733D RECEIVER. Another terrific buy! 10 tube superhet with xtal controlled local oscillator. Provision for 6 xtal channels, 108-112 MC. Complete with tubes and xtals, less dynamotor. Used. Yours for only $4.50

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FOREIGN SET OWNERSHIP

FROM the Department of Commerce comes further data on set production in various foreign countries, as reported by U. S. Embassies, Consulates and Legations.

Because of the licensing restrictions in effect in Brazil imports of assembled radios was substantially reduced during 1949. Almost all of the major foreign radio manufacturers previously supplying the market were assembling receivers in Brazil at the end of the year. The number of sets assembled in 1949 totaled 150,000 units, compared with 70,000 in 1948 and 55,000 in 1947. Insufficient stocks of some imported components prevented a larger volume of production in 1949. The United States continued to be the principal source of supply for components. However, the devaluation of the pound Sterling in September stimulated interest in components of European manufacture.

Retail sales of radio receivers continued at a high level throughout the year. Demand was confined principally to quality sets. Prices remained firm, with some of the higher priced sets selling at a premium because of their limited availability.

The purchase of two television transmitters of U. S. manufacture aroused considerable interest in the radio trade. However, no information is available on the Central Bank's policy for the importation of television receivers.

An estimated 42,000 radio receivers were in use in Iceland in March, 1950 of which 40,000 were licensed. An estimated 3.4 persons listened to each set.

Assembly of radio receivers in Mexico during 1949 totaled 116,000 sets, compared with 71,500 in 1948. Ten firms were assembling radios at the end of the year.

Imports of radio receivers totaled 7404 sets in 1949, compared with 6087 in 1948 and 185,225 in 1947. Imports of radio receiving tubes and components aggregated 25,883,454 pesos in 1949, representing an increase of 51 per-cent over 1948 imports.

The devaluation of the peso in relation to the dollar resulted in an increase in the cost of tubes and components imported from the United States. Retail prices of receivers were raised approximately 40 per-cent which resulted in a substantial decrease in sales. In order to stimulate demand some assemblers reduced discounts at the wholesale and retail levels.

An estimated 1,221,360 sets were in use as of February 1, 1950, compared with 1,113,534 on the corresponding date in 1949. About 87 per-cent of the sets in Mexico operate on a.c. power lines. An estimated 55 per-cent of the sets are designed to receive medium- and short-wave broadcasts, and 37 per-cent to receive medium-wave broadcasts only. Interest in short-wave reception has declined. Table model radios are preferred.

A television transmitter is being installed in the Mexico City area. One radio station in Mexico City is being converted for television transmission. It is expected that this station will be in operation by the end of the year. Television standards adopted in Mexico are similar to those in the United States.

Radio apparatus is produced in Norway by 27 firms, of which 20 make home type radio receivers, 2 produce commercial radio equipment as well as home type sets, and 5 manufacture only commercial equipment. About 1000 persons are employed in the industry. The average weekly wage is approximately 100 kroner (a kroner equals approximately 14 cents U. S.).

Imports of radio receivers totaled 2012 units during the period from January through November, 1949. Of this number 1218 were from the Netherlands. Only 48 sets were imported from the United States.

Imports of receiving tubes totaled 1,005,811 units during the first 11 months of 1949 of which 653,190 were from the Netherlands and 254,235 from the United Kingdom. Imports for the year 1948 amounted to 1,245,103 tubes, of which 693,017 were from the Netherlands; 311,122 from the United Kingdom, and 225,929 from the United States.

Radio receivers and tubes are not produced in the Philippine Republic. However, it is reported that one U. S. firm is contemplating the assembly of radios.

Approximately 95 per-cent of all sets imported are of U. S. manufacture. Philips (Dutch) is the principal European brand imported. Table model radios in plastic cabinets are preferred. Approximately 90 per-cent of the radios in use are designed to receive short-wave broadcasts. Since electric power is available only in the larger cities and environs, battery-operated sets are popular and account for 40 per-cent of the sets in use.

Effective December 1, 1949, annual imports of home-type radio receivers valued over \$50 (port of entry value) and radio-phonograph combinations valued over \$150 were limited to 80 per-cent of the quantity imported in 1948. Imports of home-type radios valued under \$50 and radio-phonograph combinations valued under \$150 were limited to 50 per-cent of the quantity imported in 1948. There are no restrictions on the importation of radio receiving tubes in the Philippine Republic.

An estimated 390,000 radio receivers are in use in Portugal. About 87 per-cent of the sets are designed to receive short-wave broadcasts. The number of listeners per set is estimated at 2.5 persons.

Approximately 1,200,000 radio receivers were in operation in Spain in November, 1949, of which 555,000 were licensed. About 90 per-cent of the sets in use were designed to receive short-wave broadcasts.

—30—

Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO & TELEVISION NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

GRAY "TELOP"

Gray Research and Development Company, Inc. of 16 Arbor Street, Hartford 1, Conn., has released a four-page data sheet covering its "Telop" unit for the projection of newsphotos, comics, announcements, and commercials in television studios.

There is a brief description of the operation of the unit, including data on the functioning of the various parts of the instrument. This television optical projector has been designed for use with various TV film cameras. Several of the possible applications of this unit are illustrated and described in the booklet.

Requests for additional details and copies of this data sheet should be made on the letterhead of the television station with which the writer is associated.

TV SUPPRESSION DATA

To answer the radio amateur's demand for knowledge in curing television interference, *Barker & Williamson, Inc.* has just published a 20 page booklet which contains a wealth of valuable data on the subject.

Entitled "Filter-Facts," this booklet clearly explains the causes of TVI and the procedures necessary to eliminate it, including discussions on shielding, filtering, and bypassing. Fourteen easy-to-follow wiring diagrams illustrate the right and wrong ways of making circuit connections to reduce TVI.

Copies of "Filter-Facts" may be obtained by sending 15 cents in coin to the company at 237 Fairfield Avenue, Upper Darby, Pa.

NEW W-J CATALOGUE

Walker-Jimieson, Inc. of 311 S. Western Ave., Chicago 12, Illinois, has just released its new 1950 television, radio, and electronics parts catalogue.

Specially designed for quick and easy use by the service technician, the new catalogue lists thousands of items including television equipment, radio parts, major tube lines, test equipment, tools, accessories, and other electronic supplies.

In writing for copies of this publication, please specify Catalogue No. 169.

HI-FI CATALOGUE

Of interest to the audio enthusiast is the new six-page illustrated catalogue just released by *University Loudspeakers, Inc.* of 80 South Kensico Avenue, White Plains, New York.

Devoted in its entirety to the company's complete line of high fidelity equipment, the new catalogue lists cone speakers, tweeters, tweeter adapters, crossover networks, and coaxial speaker systems.

The new catalogue is unique in that complete installation instructions are given for each model, enabling the prospective purchaser to determine beforehand what work or preparation is required.

Among the new items included in the catalogue is the company's 12 inch, 30 watt wide-range cone speaker. Complete details are given on this unit and other items in the line.

EMC CATALOGUE

The 1950 edition of *Electronic Measurement Corporation's* catalogue of electrical testing equipment is currently available from the company at 423 Broome Street, New York 13, New York.

Included in the multi-colored catalogue are listings on the company's complete line of products, photographs and specifications on all types of equipment, from the company's economy line of pocket voltmeters through the standard line of test meters to accessories such as TV antenna orienters and extension cords.

Copies of the catalogue are free on request.

SOUND GLOSSARY

A glossary of terms used by tape recording technicians and customers is currently being offered by *Minnesota Mining and Manufacturing Company* of 900 Fauquier Street, St. Paul 6, Minnesota, makers of "Scotch" sound recording tape.

The new publication, entitled "Time for Sound Talk," has been designed for use by retailers and their sales personnel in "talking the language" of tape recording customers.

Included in the booklet are four pages of technical terms and definitions, plus details on various sizes and types of sound recording tape, dual and single track recording, and different tape recording speeds.

TV ACCESSORIES

Of interest to television technicians is the new 28-page catalogue just issued by *Interstate Supply Co.* of 10th and Walnut, St. Louis 2, Mo.

This comprehensive publication lists hundreds of items needed for TV installation and servicing. Included are all types of well-known antennas, masts, and antenna kits; trailer units

you don't have to be scotch to know

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39c Ea.
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1U4
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1V
2A6
2A7
2X2
4A6
6AB4
6C4
6H6
6J5
6N6
6SA7
6SD7
6SH7
6SK7
6SQ7
6U7
6X4
6X5
12A8
12AU6
12AV6
12J5
12J7
12K7
12R5
12Q7
12SH7
24A
25Z6
26
27
32
35/51
36/44
37
76
77
78
80
VR53

45c Ea.
1B5
1T5
2A5
2B7
25/45
1B4

45c each (Cont.)
1B7
6AL5
6AT6
6BA6
6BE6
6BJ6
6AU6
6C6
6D7
6F5
6G6
6J7
6K7
6K6
6N7
6P5
6SF5
6SF7
6SS7
6SR7
6V5
7A4
7B6
7B5
7K7
7Y4
12F5
12SF7
12SJ7
12SR7
12Z3
14N7
19T8
25L6
31
32L7
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35Z4
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117Z3

50c Ea.
1X2
1B4P
1C5
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1E7
1E8
1F5
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1H4
1H6
1J6
1L4
1N5
1R4

50c each (Cont.)
1R5
1S4
1S5
3Q4
3S4
3V4
5T4
5W4
5Y3
5Y4
5Z3
6A6
6A8G
6A8
6AC5
6AD7
6AG5
6AB5
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6K6
6L5
6SC7
6S17
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7E7
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7H7
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7Q7
7S7
12AT6
12BA6
12BE6
12SA7
12SG7
12SK7
12SL7
12SN7
12SQ7
14B6
25A6
25B5
35W4
35Y4
35Z5
35Z6
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50B5
5AC5
50Y6
50
71A
75
81

50c each (Cont.)
85
2051

59c Ea.
0Z4
1C5
1H5
1U5
1LA4
1LB4
1LC5
1LD5
1LE5
1LN5
1T4
5U4
5Z4
6A7
6A8G
6B4
6BF6
6BQ6
6J6
6Q7
6U5
6V7
6Y6
6W4
6SL7
7C7
7L7
7S7
14A7
14Q7
14B7
22
25Z5
50L6
70L7
82

69c Ea.
0TA
6A3
6A8T
6AG5
6C8G
6E5
6J6
6B6
12AYT
12AX7
35A5
50A5
55
117Z6

89c Ea.
1B3
5V4
6AC7
6AN8
6BQ6
6L6
6SN7
19BG6
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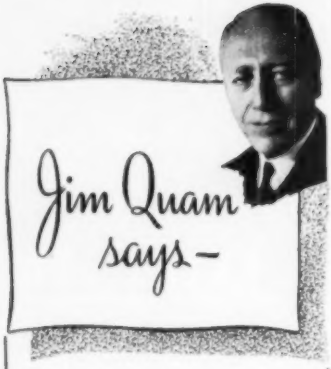

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TIMING DEVICES

An 8-page catalogue covering electrical timing devices is currently available from the *Haydon Manufacturing Company, Inc.* of Torrington, Conn.

The listing includes units for time delay, interval, repeat cycle, and elapsed time functions. The two-color catalogue is illustrated with photographs, dimensional drawings, and diagrams. A brief discussion of each type of unit gives important features, specifications and ratings, along with ordering aids.

Copies of the catalogue may be secured by addressing requests to E. B. Hamlin, Advertising Manager, at the company. Ask for catalogue No. 323.

PERMOFLUX CATALOGUE

Permoflux Corporation of 4900 West Grand Avenue, Chicago 39, Illinois has just issued a four-page catalogue that describes the company's new "Royal Eight" Model 8T-8-1 speaker in some detail.

The catalogue, No. J201, carries a response curve on the new speaker and full details on the constructional features that give this unit the same performance as comparable 12" speakers, according to the company.

A particularly valuable section of the folder is data on the proper baffling of the speaker or speakers. All dimensions are given for the baffle cabinet in addition to details on the materials to be used both for the outside and as lining. —30—

MEXICAN TV

MEXICO'S first television station, equipped with a 5 kw. transmitter and associated studio and mobile pick-up units supplied by RCA, is scheduled to go on the air in Mexico City this summer.

The station, owned and operated by Television de Mexico, S.A., will operate on Channel 4 and will be located in the 20-story National Lottery Building in the center of the Mexican capital. In addition to studios, rehearsal halls, scenery storage space, and offices on the upper floors, provision has been made on the ground floor for a large auditorium which will be used for televising concerts and stage plays.

In preparation for the opening, Romulo O'Farrill, Sr., publisher of the newspaper "Novedades" and owner of Television de Mexico, arranged for members of the station staff to visit the RCA Victor plant in Camden, New Jersey for a study of manufacturing operations and to observe program production methods at NBC's studios in New York.

RCA Victor Mexicana, S.A., RCA's associated company in Mexico, is installing the equipment. —30—

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HOTTEST surplus list in country. Electronics-Hydraulics, Aircraft-Gadgets. Dick Rose, Everett, Wash.

RADIO Diagrams 50c; Record Changers, Recorders 60c; Television Diagrams with service data $1.00 up. State Manufacturer and model number. Kramer's Radio Service, Dept. RX, 36 Columbus Ave., New York 23, N. Y.

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ERRATA

In the schematic diagram appearing on page 56 of the May issue ("A High Efficiency Triode Amplifier"), the lead from the lower end of CR to ground should be removed.

* * *

In the article "Transmitter Keying and Biasing Problems," appearing in the April issue, the value of R, in Fig. 4 (page 66) should be 500 ohms, 10 watts.

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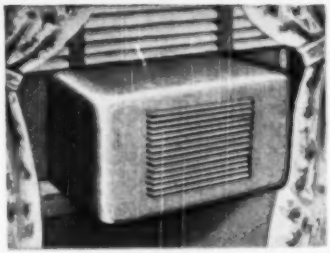

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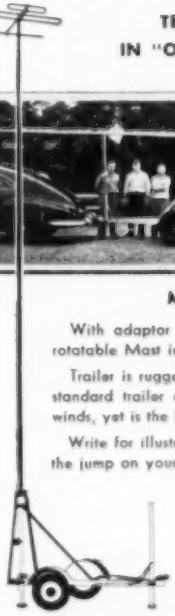

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Geiger Counters

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stant and it is then applied to the nine hundred volt Geiger tube. The advantage of this circuit is that the current drain is very small which makes possible a long battery life. It is also lightweight and small in size.

The Model 106 has earphones, a neon flasher, and a three range meter as indicating means. It weighs about three and one half pounds. It detects both betas and gammas.

The manufacturers of Geiger counters have brought the price of their product down to well within the reach of the public. Not long ago any kind of a counter sold for several hundred dollars. All but one of the instruments described here sell for less than one hundred dollars.

Great progress has also been made in size and weight. In the past, Geiger counters weighed anywhere up to a hundred pounds or more and were very cumbersome. Now the more modern instruments weigh only a few pounds and most are small enough to fit in the palm of a hand.

The use of the Geiger counter is very simple and requires no experience. When surveying a location the prospector takes the count of the number of clicks per minute heard in the earphone. This count is a measure of the strength of the radioactivity present at the location. In doing this it is important to know that a small number of pulses exist even when no uranium is near. These pulses are caused mainly by cosmic rays and are known as the "background count." The background count must be deducted to obtain the correct reading. Generally speaking when the number of clicks are double or triple the average background count of the area, uranium may be present. When the instrument includes a neon flasher the neon lamp will flash with each pulse which makes it possible to use the instrument without wearing earphones. In order to better evaluate results an instrument with a meter should be used. The intensity can then be read directly on the meter and no count need be taken. Since the intensity varies over wide ranges a three range meter is the most practical. With an instrument of this type the quality and quantity of ore may be estimated in the field.

Uranium occurrences in the United States are by no means rare. The large carnotite deposits of Utah and Colorado have been mined for some time. Rich strikes have been reported in California, Nevada, Arizona, and other states. In over half of the forty-eight states, as well as Alaska, uranium occurrences have been found. In most cases the amounts have been insignificant in view of the insatiable demand. The government is, therefore, doing everything in its power to spur the search. The era of Geiger counters is indeed here.

—30—

VACATION FESTIVAL OF BARGAINS!

Columbia
GEM OF THE SURPLUS

PE104 VIBRATOR POWER SUPPLY: For BC654. Input 6 or 12 V. Output, 51 V. neg. plus, 90 V. B plus @ 5-10 mils. 1½ V. element @ 350 mils. Excel. cond. $7.50

10-6A 4PN4 LORAN SCOPE & R-9A 4PN4 POWER SUPPLY RECEIVER COMBINATION DEAL: Scope is suitable for conversion test scope and other useful indicators. Has a 5CP1 scope 1-7in and 100 kc xtal for controlling sweep freq. 27 tubes, tons of useful parts. 400 cycle power supply can be easily converted to conventional 60 cyc. Receiver can be converted to 160 meter band. Both units complete with xtal, and tubes. Excel. cond. Excellent for Marine Use as PPI Radar $29.50

MARINE COMBINATION DEAL this month only: COMBINATION TRANSMITTER-RECEIVER: BC-312 Receiver, 1.5-18 mc. & BC-223 25-watt Transmitter, PE55, 12 V. power supply, cords, mike & speaker. Less xtals. Excel. cond. $99.50

BC 731 & R 89 ARNS LOCALIZER & GLIDE PATH RECEIVER COMBINATION: Tuerif receiver for FM & 2 meter band. Complete with tubes & xtals. Both in good cond. ..... PAIR $9.95
See March/50 RADIO & TELEVISION NEWS for conversion.

TEST EQUIPMENT: BC221 Freq. meter. Excel. cond. $59.50
LM Modulated Freq. meter. Excel. cond. 62.50
BC906 Freq. meter. Excel. cond. 10.95
TS 56 AP 27.50

COMPLETE RECEIVERS ALL EXCEL. CONDITION
BC-224, 1500-18,000 kc. 110 V 60 cyc. $62.50
BC-342, 1500-18,000 kc. 110 V 60 cyc. 62.50
BC-344, 1500-18,000 kc. 110 V 60 cyc. 62.50
BC-348, 200-18,000 kc. 28 VDC 62.50

APR-1 RECEIVER & TUNING UNITS: 30 mc. IF strip, bargain, contains detector & audio stages. Excel. for use with front end converter for UHF Receiver, with plug in tuning converter. Excel. cond. like new $124.50
PROP PITCH MOTOR: Excel. for heavy beam rotating. 1 rpm. operates on 28 VAC or DC. Gear reduction 9,000 to 1. New in orig. carton. $12.50

274N ANTENNA RELAY BOX
Contains RF meter plus 50 mmfd R. V. vacuum cond. and relay. New in carton $2.25
SAME but less meter, cond., used, good cond. ..... .99
EE-8 FIELD TELEPHONE: Uses 2 flashlight bat. Has crank for ringing other phone. Ideal for use in field, mines, camp, home to lab. or garage, etc. Excel. operating condition. Early model ..... $ 6.75
ORDER a PAIR for ONLY 12.95

COLUMBIA'S GEM OF THE MONTH
Nobody, but nobody can beat this: 274-N 40 METER TRANSMITTER-RECEIVER COMBINATION
Receiver, 3-9.1 mcs. Transmitter, 7-9 mcs., all tubes, xtals, etc. Good cond. Regular $17.95
BOTH, this month only, $10.95.

SCR 522 TRANSCEIVER: 100-156 mc. With tubes and push-button control box $24.95
ACCESSORIES FOR 522 RECEIVER-TRANSMITTER
PE-98 12 V. power supply. Used. $12.95
PE-94 24 V. power supply. 2.95
PE-12 110 V. power supply, good cond. 17.50
Set of 7 plugs. New 3.95
BC1303 Mike Adapter & Test Unit 5.00

ARC-5 OR 274-N TRANSMITTERS COMPLETE
2.1-3 mcs. Excel. for ship use. New $12.95
3-4 mcs. Used, excel. cond. 9.95
4-5.3 mcs. Used, excel. cond. 3.50
5.3-7 mcs. Used, excel. cond. 3.50
7-9.1 mcs. Used, excel. cond. 9.95
ARC-5 OR 274-N RECEIVERS
1.5-3 mcs. For ship use. Excel. cond. $14.50
3-6 mcs., excel. cond. 1.95
6-9.1 mcs., good cond. 5.95
190-550 kcs., excel. cond. 9.95
Command Receiver flex. cable 6' ..... .95
Command Receiver 28V dynamotor ..... .79
Command Knobs for Receiver, Ea. ..... .69

BC 375 TRANSMITTER: 150 W. Phone or CW. 2nd 211 tubes in final. Complete with all tubes but less tuning unit $10.95
BC 191 TRANSMITTER: Same as BC 375 above but 12 V. operation. Good cond. $15.95
BC 375 TUNING UNITS: TU-10, 10 to 12.5 mc. TU-6, 3 to 4.5 mc. TU-22 .235 to 450 kc. TU-26, 400 to 500 kc. Excel. cond. Ea. $1.50
ORDER 10 FOR ONLY $10.00
TCS MARINE RECEIVER & TRANSMITTER: Complete with all tubes and dynamotor, less crystals. 24 volts, 12 V. operation. Excel. cond. $169.50
ART 13 TRANSMITTER: 813 final, 2—814 mod. 250 watts. Excel. cond. $94.50
SIGNAL LAMP: Pistol grip, 12 V. 6.6 amp. New $2.95
ARC UHF RECEIVER: 30 mc. tuning spread. Will cover 400-500 mc. Ideal double converted super het. 6 stages I.F. audio output. Excel. cond. $9.95
FLR FILTERS: 1020 cycle, used. Ea. 75c
RECORD CHANGERS: 78 r.p.m. Standard trends. Very new $14.95
TU17 & 18 TUNING UNIT: For BC221 Transmitter. TU17 covers 2-3 mc. TU18 covers 3-4.5 mc. Excel. shape $1.95

ECLIPSE INDICATOR: Dual scope contains 2 of everything, 5FP7, 6H6, horizontal, deflection coil, intensity control, focus control, etc. Use 1 vide and 1 will have enough room to build a scope, modulation monitor, etc. Excel. cond. $10.95

BC433 COMPASS RECEIVER: 200-1750 kc. 115V 400 cy. input. Convert for home receiver or use as aid. Complete with tubes. Excel. cond. $12.95
CONICAL TV ANTENNA: New 5.95

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CHICAGO
RADIO AND APPLIANCE MULTITESTER

Model 458A

New Wider Ranges

NEW CASE DESIGN FOR EASY READING

AC and DC VOLTS: 0-2.5/10/50/250/1000/5000
AC AMPS: 0-0.5/1/5/10 DC AMPS: 0-1/10
AC and DC MILS: 0-1/10/100
OHMS FULL SCALE: 1000/200,000/2,000,000
OHMS CENTER SCALE: 50/2250/22,500
SIZE OVERALL: 10½"x6½"x6" Meter: 4½" wide.

Handsome brown Hammerloid case with leather strap. 1000 Ohms per volt. Net Price $26.00

We manufacture a complete line of fine portable multitesters.

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High gain consisting of director, high and low folded dipoles and reflector. Speed-rig. Lo Loss insulation. Complete with all hardware, less mast.

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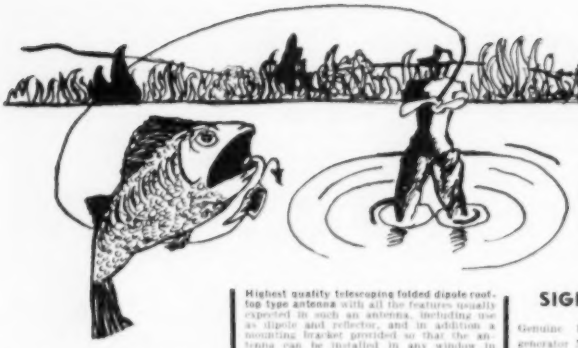

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"SPECIAL ANNOUNCEMENT" FCC AUTHORIZES RADIO FOR PRIVATE SERVICE!!!

(The FCC announced that effective June 1, any American over 18 years of age may be eligible for a 5 year station permit. In the "Citizens" band, no code test or technical knowledge are necessary for transmission.)

GENERAL ELECTRIC 15 TUBE TRANSMITTER-RECEIVER SET. This brand new 15 tube transmitter-receiver was designed for mobile storage battery powered service. Properly modified, it will operate on voice in the Citizens Band. It's a cinch for the experimenter to connect this unit for 110-volt a.c. operation by following the instructions and diagrams supplied, which cover numerous applications, including FM and amateur television transmission and reception. For those intending to use on car or boat, a new dynamotor, exactly as originally supplied, costs only $15.00. Don't fail to write for FREE descriptive bulletin. Order our RT-1248 for only **$29.95**, or two for **$53.90**

Highest quality telescoping folded dipole rooftop type antenna with all the features usually expected in such an antenna, including use as dipole and reflector, and in addition a mounting bracket provided so that the antenna can be installed in any window in two minutes or less. Any slight loss in gain because of the reduction from rooftop height is more than compensated by the ability to orient the antenna instantly by opening the window and adjusting for maximum signal strength. Mounting bar can be installed horizontally or vertically in window frame or even between attic rafters, whichever is most convenient. Your cost **$7.00**. With high frequency attachment for channels 7 to 13 **$8.00**. Either type 10% loss in dozen lots.

LINE FILTERS—Each unit contains two 4 Mfd. oil filled condensers and a high inductance 50 Amp choke in fully shielded case. Suitable heavy current connectors are provided to attach to the input and output connectors at each end of the filter from your input and output wires. A filter with innumerable uses on oil burners, refrigerators, boats, automobiles and wherever noise is to be suppressed or interference abolished. A $27.00 value for **$2.98**.

SIGNAL GENERATOR

Genuine Laboratory-type precision signal generator. Manufactured and sold for $68.00 each in large quantities during the war by Northeastern Engineering Corp., one of the top manufacturers of electronic equipment for the U.S. Govt. Five fundamental bands starting at 150 KC. Strong harmonics up to 120 MC. Five step ladder type attenuator as well as potentiometer output control. Regular 1000 cycle audio oscillator using vacuum tube, not a cheap neon gaseous audio oscillator. Audio output separately available externally. Weight without packing material 16 lbs. which should show what a world of difference exists between this signal generator and the ordinary cheap oscillator used by the average serviceman. Complete with fused plug and coaxial output lead. Super Special **$38.75**

$6.95 TAKES ALL THREE BIG BARGAINS "E"

1. **AUDIO AMPLIFIER**—Brand new push-pull output triode amplifiers having 2 of the valuable and scarce output type audio transformers that sell for over $10.00 apiece. Neat aluminum case, fully enclosed (largest dimension 6 inches). Perfect for intercom systems, phone amplifiers, mike amplifier, or signal tracer amplifier for testing radio sets. A sensational bargain at only **$3.48 each**
2. **BANDSWITCHING TUNING TURRET** made by Western Electric. Covers 4 bands above 100 Mc. All coils wound with #14 silver-plated wire. Complete with tuning condensers and powerful electric driving motor. ONE OF OUR MOST TERRIFIC VALUES—ONLY $2.95
3. **CARBON MIKE** with Push-To-Talk Switch and Gold Plated Carbon Lapel Mike. Combination offer on both items $6.75

DELUXE SUPERHET A.C.-D.C. RADIO KIT

Extra high quality radio in kit form with complete instructions. Features 2 ton cone I.F. transformers, a 2 gang condenser, and polyethylene insulated edgewise wound antenna loop. 12AT6, 12BA6, 12BE6, 50B5 & 35W4 tubes supplied. Receives broadcast band from 530 to 1700 KC. Kit form $8.75 or 2 for **$17.00**. Assembled, Wired & Tested **$12.95** or 2 for $25.00

COMPRESSED AIR

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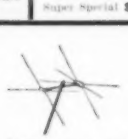
Portable Air Compressor and Storage tank. Ruggedly built. Best Materials Lifetime lubricated ball bearing on connecting rod and oil impregnated main bearing on shaft. Unusual design forever eliminates valve trouble, the most common fault in air compressors.

PATENTED unique air intake system increases efficiency tremendously so that air output is much greater than that from larger compressors governed by bronze motor. Delivers approximately 3300 cu. inches of air per minute at maintained pressure of 30 lbs., so will inflate a 30 lb. truck tire in less than one minute. Complete with 100 ft. hose. Finger-tip adjustment allows setting of output pressure at any value, which will automatically be maintained. Works from any ¼ H.P. motor. Useful for spraying paint, lacquer, disinfectant, insecticide, annealing or brazing with natural gas, inflating tires, etc. Price **$14.50** postage prepaid anywhere in the U.S. Efficient, completely adjustable explosion type spray gun complete with 12 ft. of 100 lb. tested hose unit **$7.75** with pint container, also prepaid.

Full size folded dipole with reflector and mast. Stand-off insulators included. $4.75 complete. $40.00 per dozen. Order No. 6430.



Latest model fan type control with reflectors. Better on all channels, but especially is most terrific on higher channels. A year ago we advertised an antenna that sold for over $100.00. This antenna is better. $4.75 each. In lots of 10—$40.00. Order No. 6491.

LAPEL MIKES—(Specify whether carbon or magnetic) 93c

Connector bars for double stacking either antenna. FREE with orders for 2 or more.

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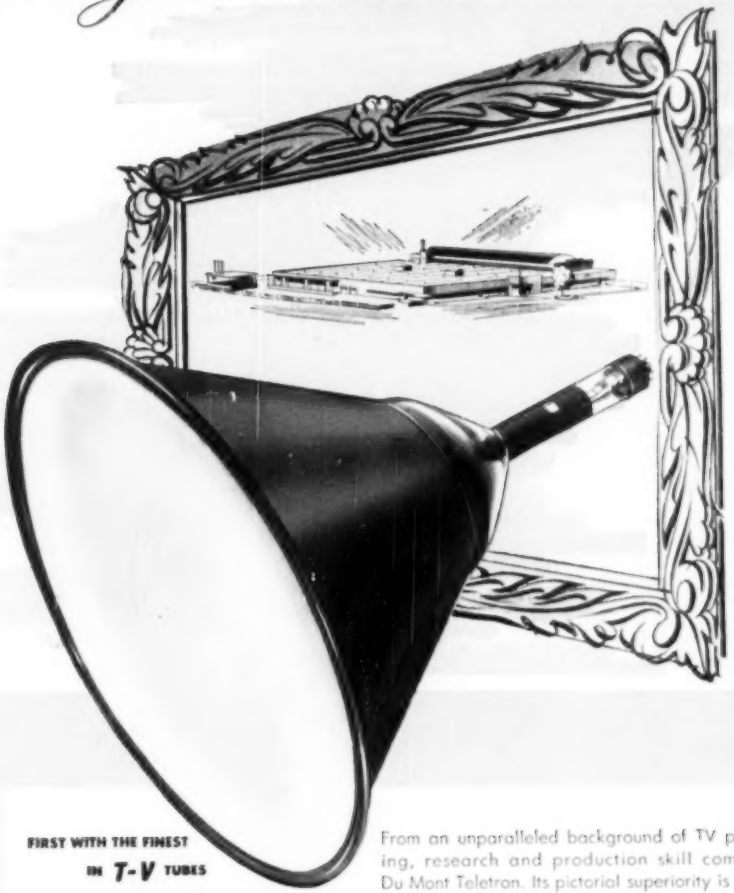

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